



Contents lists available at ScienceDirect

Journal of Business Research

journal homepage: www.elsevier.com/locate/jbusres

Organizing for digital servitization: A service ecosystem perspective

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ARTICLE INFO

Keywords:

Digitalization
 Servitization
 Service ecosystem
 Digitization
 Centralization
 Integration

ABSTRACT

Harnessing digital technology is of increasing concern as product firms organize for service-led growth. Adopting a service ecosystem perspective, we analyze interfirm and intrafirm change processes taking place as firms pursue digital servitization. The study draws on in-depth interviews with 44 managers involved in organizing activities in two multinational industry leaders. Our findings identify major differences between the two focal firms in terms of digital service-led growth and associated ecosystem-related activities. The study disentangles underlying processes of organizational change in the ecosystem and suggests that within-firm centralization and integration play a key role in the capacity to organize for digital servitization. For managers, the findings highlight the need to foster service-centricity in order to take full advantage of digitalization beyond purely technological benefits.

1. Introduction

The growing digital disruption across industries and ecosystems is blurring boundaries and altering established firm interdependencies and network positions. Digitalization involves the use of digital technology to provide new value-creating and revenue-generating opportunities (Gartner, 2017) and typically goes “hand in hand with adopting a servitization strategy” (Parida, Rönnberg Sjödin, Lenka, & Wincent, 2015, p. 41). While engineering corporations such as ABB, General Electric, and Siemens are investing strategically in data gathering and analytics capabilities and in cloud-based platforms, many industrial firms remain concerned about how to best address digital disruption and enable digitalization (KPMG, 2017; Lohr, 2018). Furthermore, General Electric recently told investors that expenses at their digital unit responsible for Predix, its software platform for the collection and analysis of data, will be cut by more than 25% (approx. US\$400 million) (Lohr, 2018), thus highlighting the difficulties involved in adopting digital technology in an industrial business. Previous research on digital servitization (Rapaccini & Gaiardelli, 2015) has investigated such issues as growth trajectories (Coreynen, Matthyssens, & Van Bockhaven, 2017), service business orientation (Kowalkowski, Kindström, & Gebauer, 2013), platforms (Cenamora, Rönnberg Sjödin, & Parida, 2017), exploitation of big data (Opresnik & Taisch, 2015), and

supply chain interdependencies (Vendrell-Herrero, Bustinza, Parry, & Georgantzis, 2017). Clearly, then, digitalization poses new questions in relation to key drivers and enablers of servitization.

The term *digital servitization* refers to the utilization of digital tools for “the transformational processes whereby a company shifts from a product-centric to a service-centric business model and logic” (Kowalkowski, Gebauer, Kamp, & Parry, 2017, p. 8). Studies of how the shift toward servitization is organized have tended to focus on issues such as separation of product and service organizations (Oliva, Gebauer, & Brann, 2012), local responsiveness (Kowalkowski, Kindström, & Brehmer, 2011), internalization (Salonen & Jaakkola, 2015) and externalization (Paiola, Saccani, Perona, & Gebauer, 2013) of service business, and organizational design configurations (Raja, Chakkol, Johnson, & Beltagui, 2018). However, despite the growing research interest in organizational aspects of the move to servitization, the issue of organizing specifically for digital servitization remains underexplored. Digitalization entails the decoupling of information from the devices and technologies that can potentially reshape the nature of service activities (Lusch & Nambisan, 2015). This decoupling leads to knowledge dispersal and creates a need to collaborate—not only with internal organizational actors but also with actors from outside the firm's boundaries. Against that backdrop, we adopt a service ecosystem perspective to analyze interfirm and intrafirm change

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Received 22 October 2017; Received in revised form 5 February 2019; Accepted 6 February 2019

Available online 14 February 2019

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processes taking place as firms pursue digital servitization.

The service ecosystem perspective helps to illuminate the structural flexibility and integrity of digital systems (Lusch & Nambisan, 2015). By viewing firms as networks of spatially dispersed and potentially goal-disparate entities, it also helps to explain internal and external conditions (Ghoshal & Bartlett, 1990), providing a holistic view of how digital servitization is organized from the viewpoint of the focal actor. This article makes two important theoretical contributions to the research on organizing for servitization. First, we contend that the role of centralized decision-making is more important for digital servitization than for traditional service growth. The study shows how the commonality of digital platforms and customer interfaces across segments and markets, supported by a consistent implementation, can enhance both global efficiency and responsiveness to customer needs. Second, digitalization enables firms to reshape their service activities and processes (e.g., toward software centrality), which is closely linked to changing the roles of back- and front-end units. The study reveals how successful implementation of a digital servitization strategy requires more purposeful and coordinated effort—with closer coupling between units—as compared with more traditional field service strategies.

The remainder of the article is organized as follows. Section 2 reviews the literature on service ecosystems, digital servitization, and organizing for the latter. Section 3 describes the research method, and Section 4 presents the study findings. Section 5 discusses our results in relation to the extant research. Finally, Section 6 considers the implications for theory and practice and suggests avenues for further research.

2. Theoretical framework

2.1. The service ecosystem perspective and embeddedness

The service ecosystem perspective examines digital servitization through a holistic, multi-actor lens and emphasizes the systemic, dynamic, and contextual aspects of the phenomenon as influenced by the interactions between actors (Edvardsson, Tronvoll, & Gruber, 2011; Tronvoll, 2017; Vargo & Lusch, 2011). This perspective broadens the scope of digital servitization beyond the firm-centric to explore the collaboration of interfirm and intrafirm actors. This collaborative process is characterized by its *embeddedness*. Encompassing both the characteristics and the effects of service ecosystem relationships (Granovetter, 1985), embeddedness is the notion that “economic action and outcomes, like all social action and outcomes, are affected by actors’ dyadic (pairwise) relations and by the structure of the overall network of relations” (Granovetter, 1992, p. 33). In this way, embeddedness affects the actions of service ecosystem actors and the outcomes of relationships between them, influencing the overall structure of the ecosystem itself (Uzzi, 1996).

The relational aspect of embeddedness is characterized by a closeness between certain actors within the service ecosystem, manifested by high levels of adaptation (Baraldi, Gressetvold, & Harrison, 2012). Here, a distinction can be drawn between intrafirm and interfirm *relational embeddedness* (Moran, 2005), emphasizing that service ecosystems comprise both internal and external actors. Intra-organizational relational embeddedness influences the focal actor’s ability to access and combine resources from corporate counterparts; the more internally embedded the focal actor, the more strongly it will influence its counterparts’ knowledge and competences (Forsgren, Holm, & Johansson, 2005). Internally embedded firms acquire more of their service knowledge through in-house development and operations, enabling them to retain greater control over labor and domain-specific expertise (Kowalkowski & Ulaga, 2017). In so doing, firms tie up resources internally. In contrast, actors that lack intra-organizational embeddedness must look beyond the firm to access important resources—that is, they rely on inter-organizational embeddedness. Externally embedded firms may therefore need to persuade other actors in

the ecosystem to support the firm’s digital servitization efforts. This becomes more difficult if those other actors are large and powerful, if they are competing for the same customer relationships, or if they are pursuing similar servitization processes (Salonen & Jaakkola, 2015).

Embeddedness also implies that actors become aware of changes in the service ecosystem; this *structural embeddedness* is important for ecosystem viability, as actors adapt to each other according to their expectations of change (Gulati, 1998). Structural embeddedness is important for making change happen within a structure (Uzzi & Lancaster, 2003)—as for instance within a service ecosystem—because closely embedded actors share more resources, knowledge, and skills (Podolny, 2001). For that reason, the actors involved in adjusting a service ecosystem toward digital servitization must adapt their activities to each other, with direct consequences for revenue streams and economic behavior. This structural embeddedness encompasses and influences such interrelated activities as service development (Lusch & Nambisan, 2015) and production processes (Håkansson, 1989) and affects resources and their availability (Baraldi et al., 2012), as well as institutional arrangements such as norms and rules (Koskela-Huotari, Edvardsson, Jonas, Sörhammar, & Witell, 2016; Lawrence & Suddaby, 2006).

2.2. Digital servitization

In the management and marketing literature, a growing number of studies focus on *digitization*, which essentially means transforming analog into digital (Hsu, 2007). However, as digitization is rapidly becoming commoditized (Carr, 2003), differentiation depends on the new practices it enables (Brown & Hagel, 2003). To succeed, firms must master *digitalization*, which includes the socio-technical processes that accompany digitization (Lusch & Nambisan, 2015). Here, we understand digitalization to mean the use of digital technology to provide new value-creating and revenue-generating opportunities (e.g., Gartner, 2017), which echoes the notion that the acquisition of strategic customer data is a necessary but not sufficient condition for servitization (Ulaga & Reinartz, 2011). In this view, digital technology can play a key role in the management of relational and structural embeddedness in the service ecosystem (cf. Story, Raddats, Burton, Zolkiewski, & Baines, 2017), and firms organizing for digital servitization need to harness those organizing capabilities (Cenamor et al., 2017; Parida et al., 2015).

Previous research has commonly focused on how digital technology enables new service offerings to compete in increasingly complex markets (Coreynen et al., 2017; Neu & Brown, 2005), identifying data analytics as a major driving force for new asset efficiency services such as remote monitoring and software customization (Ulaga & Reinartz, 2011). Remote monitoring of product location, condition, and use is essential if manufacturers are to base new business models on advanced services (Baines & Lightfoot, 2013). Once digital services are in place, the marginal cost of producing and upscaling service operations should ideally be close to zero (Rifkin, 2014).

Digitalization also facilitates reconfiguration of the interfirm and intrafirm embeddedness (resource configuration) required to respond to exogenous changes in the ecosystem (Parida, Oghazi, & Cedergren, 2016). This has an inherently disruptive effect on the competitive landscape and on existing service ecosystems, as even established actors face competition from new entrants outside traditional industry boundaries (e.g., hardware and software specialists) (Christensen, 1997). This is a consequence of the incorporation of increasingly advanced digital technologies in physical goods, catalyzing the convergence of previously distinct industries (Yoo, Boland, Lyytinen, & Majchrzak, 2012). To respond to such ecosystem dynamics and to organize the necessary change processes, firms must reconfigure their embeddedness structure (e.g., Normann, 2001).

2.3. Organizing for digital servitization

To reap the benefits of servitization, firms need to organize a structure that aligns appropriately with strategy (Neu & Brown, 2005). A firm's structure is primarily determined by two factors: (1) matching internal capabilities with strategic business requirements and (2) administrative heritage (Bartlett & Ghoshal, 2000; Leong & Tan, 1993). A strong local presence and responsiveness to market differences and customer preferences is especially important if business is local, as is often the case with services. In contrast, centralized decision-making is more appropriate if the priority is global efficiency and the need for local adaptation is low (Bartlett & Ghoshal, 2000; Kowalkowski et al., 2011; Mintzberg, 1996). When customer relationships are organized locally, centralization can cause severe internal corporate dissonance (Ghoshal & Nohria, 1989). To overcome this problem, servitizing firms often grant significant decision-making authority to lower-level managers who are closer to the customer (Neu & Brown, 2005). However, many successful manufacturers subsequently re-centralize decision-making processes (Vendrell-Herrero, Gomes, Bustinza, & Mellahi, 2018) and introduce a central coordination unit (strategic center; Davies, Brady, & Hobday, 2006) to transform the organization.

Relational and structural embeddedness is critical when organizing for digital servitization, as the complexity of advanced services and solutions requires extensive collaboration with actors (Gebauer, Paiola, & Saccani, 2013). Embeddedness also facilitates better understanding of market conditions and of complex and changing customer needs (e.g., Neu & Brown, 2005). While embeddedness shapes corporate activities, the ability to execute those activities is constrained by the firm's administrative heritage, which is the “existing configuration of assets, traditional distribution of responsibility, and historical norms, values, and management style” (Bartlett & Ghoshal, 1988, p. 56). For a firm undertaking servitization, this heritage may hinder organizational change (cf. Shah, Rust, Parasuraman, Staelin, & Day, 2006). To break free from a product-centric structure and business logic, manufacturers typically organize separate service organizations to enhance performance accountability and service orientation (Oliva & Kallenberg, 2003; Oliva et al., 2012).

Given the inherent tension between product and service units (Fischer, Gebauer, & Fleisch, 2012), many companies also create new structures comprising customer-facing front-end units, back-end product and service units, and a strong strategic center for decision-making and coordination (Kowalkowski & Ulaga, 2017). When organizing for digital servitization, product and service units may be assigned new roles in a front–/back-end split, where back-end units handle activities related to the modular product-service architecture while front-end units assume responsibility for customizing module-based offerings (Cenamor et al., 2017). That said, different configurations of product and service units and front-end and back-end units may exist concurrently within the same organization (Raja et al., 2018). In general, a firm's ability to organize for digital servitization will depend on its heritage and its capacity to reconfigure its internal and external resource base.

3. Research method

To investigate the interfirm and intrafirm change processes associated with the pursuit of digital servitization, we conducted a multiple case study. The case study approach facilitates a better understanding of complex social phenomena (Bryman & Bell, 2015) such as digital servitization.

3.1. Case selection and description

Theoretical sampling was employed to select two case firms (Bryman & Bell, 2015), prioritizing cases that were likely to produce contrary results for predictable reasons (Yin, 2014). Case selection was

based on three criteria: (1) to minimize extraneous variation and to acquire comparative data for theory building, we focused on ecosystem actors in similar industries; (2) we selected firms that actively pursued digital servitization; and (3) we chose cases that would provide access to key informants and secondary data. The research design allows for case comparisons, which are favored in theory-generating case studies (e.g., Halinen & Törnroos, 2005; Miles & Huberman, 1994).

The two case firms are owned by the same multinational corporation (MNC), which employs more than 100,000 people across more than 100 countries. This was advantageous in two ways. First, being able to access informants with knowledge of both firms provided valuable complementary insights. Second, although both organizations were considered successful in terms of servitization and relied upon shared corporate strategies, we found crucial differences in how they organized digital servitization. To preserve confidentiality, both the case firms and individual informants are anonymized. “Apparatus” is an original equipment manufacturer that operates in an ecosystem providing electrical equipment for industrial machines and offering after-sales services. “Oceana” is a systems integrator within an ecosystem that provides a wide range of equipment, as well as offshore and on-shore services.

3.2. Data collection

In both cases, the primary data source was in-depth semi-structured interviews with 44 key informants—executives, central managers, and local managers who were involved in digital servitization projects. The interviews focused on how the respondents experienced and managed the transformation in relation to other actors within the ecosystem (e.g., customer firms). The respondents included 29 employees of Oceana and 11 employees of Apparatus while four were from central corporate functions. As new questions emerged following earlier conversations, 13 of the informants were re-interviewed on up to three occasions. We conducted fewer interviews with the two latter groups because information redundancy (Lincoln & Guba, 1985) was reached sooner. Major characteristics of the collected interview data are summarized in the Appendix A. The primary data also included observations during site visits and meetings, and secondary data were collected from company documents, industry magazines, newspapers, websites, and social media.

3.3. Data analysis

For the purposes of comparative analysis, we conducted a peer evaluation process (Miles & Huberman, 1994). All of the researchers who collected the data were also involved in coding, which was based on independent parallel analysis of data items and investigator triangulation (Bryman & Bell, 2015). This process included comparison and interpretation of interview transcripts, notes from observations and meetings, and data from secondary sources.

The coding process began by establishing first-order codes across the collected data (cf. Raja et al., 2018). Initial coding yielded about 250 categories; subsequent re-coding to identify similarities reduced the number of categories to 36. By identifying relationships between these codes, we formulated seven second-order themes, which were labeled based on the theory. We then arranged the seven themes at a higher level of abstraction into three aggregate themes. To ensure the validity of the coding structure, we performed an inter-judge reliability test (Perreault & Leigh, 1989); the final coding structure is shown in Fig. 1. Finally, we identified, sorted, and structured insight-stimulating examples (Sellitz, Wrightsman, & Cook, 1976) as representative instances of each aggregate theme, which are described in Section 4.

4. Findings

Our analysis revealed major differences between the two focal firms

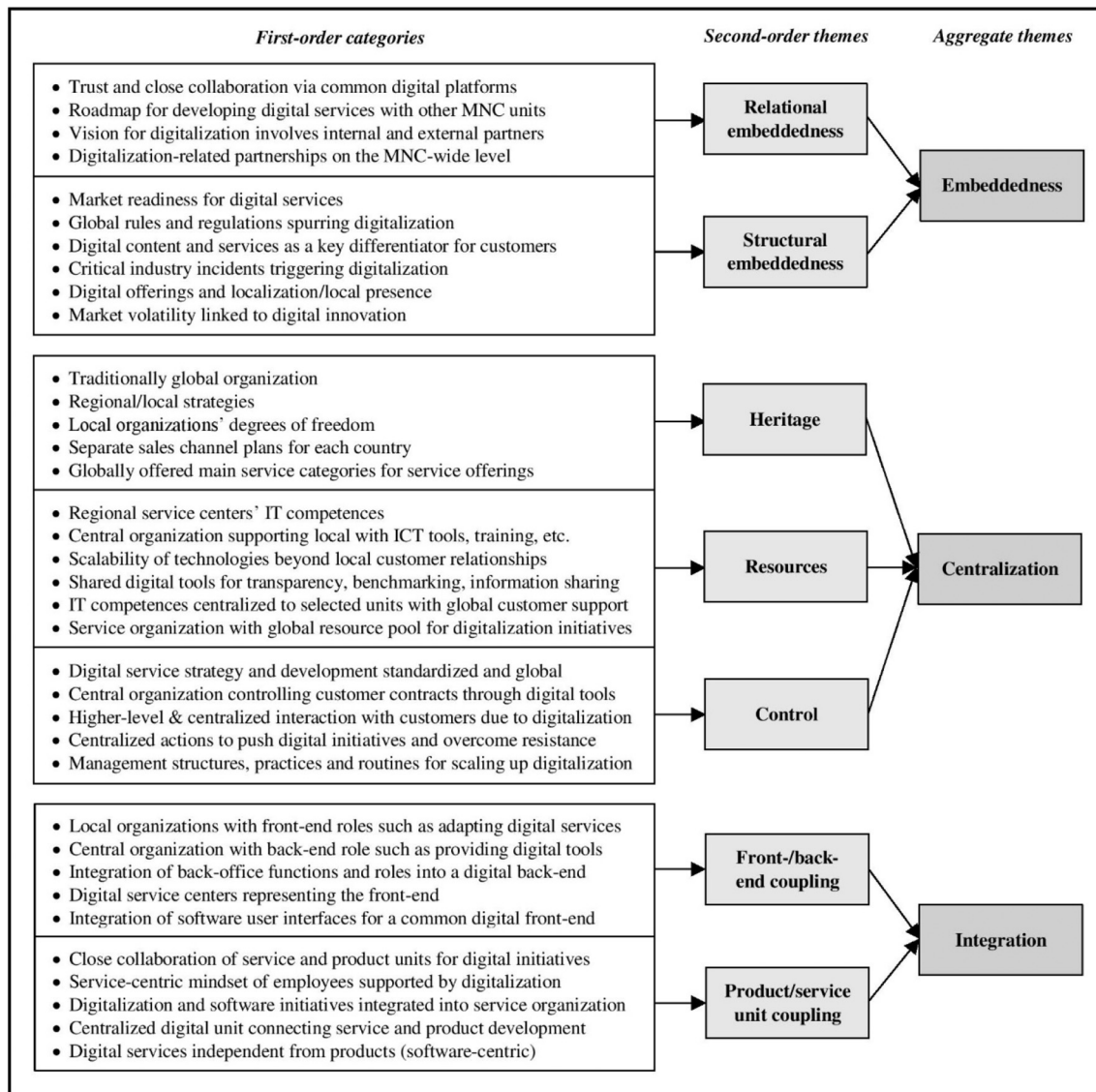


Fig. 1. Coding structure.

in relation to digital servitization and associated organizing activities, which are closely linked to complex transformations within each firm's ecosystem. Following the order of aggregate themes in the coding structure (see Fig. 1 above), we describe the two ecosystems and relevant findings below. Representative quotes are provided in Table 1.

4.1. Embeddedness

Within its ecosystem, Apparatus interacted mainly with the multinational corporation's (MNC) headquarters and acted as a supplier to other firms within the MNC—commonly systems integrators with strong links to the end user. In parallel, Apparatus reached end users through customers external to the MNC—that is, service partners, including OEMs, systems integrators, and service providers. The ecosystem also included a consulting company that focused on project management, a firm specializing in analytics and data mining, a service design company, and an MNC-wide digitalization and software partner. Fig. 2a shows the ecosystem of Apparatus.

Our findings indicate the importance of ecosystem actors for digital servitization at Apparatus. For example, service partners (and occasionally end users) were closely involved in the development of digital offerings. Although the industry had started to move toward

digitalization in response to changing customer expectations, the mindset of many actors prevented them from fully accepting digital services. While at first “everybody was afraid of internet connectivity,” concern subsequently shifted to cloud-related issues such as data storage, analytics, cyber security, and disclosure. Under these conditions, our informants pointed frequently to trust as the foundation for collaboration, both internally and externally. Increasing collaboration with customers and with the MNC's other firms was considered essential to resolving trust-related issues, and this was reflected in Apparatus' organizing activities for digital servitization. Closely related to these efforts, the focal firm's move toward localizing digital services sought to adapt to local customers' specific needs and varying levels of digital readiness. However, while the role of systems integrators in the industry had increased, the focal firm remained a product supplier, diminishing Apparatus' power to organize for digital servitization in its ecosystem.

Unlike Apparatus, Oceana had transformed itself from product supplier to systems integrator, enabling the firm to “dictate and design” when developing digital services in collaboration with other firms within the MNC. Also unlike Apparatus, Oceana's customers were mainly external to the MNC and included system builders, asset owners, and a group of actors who were both end users and operators. Overall,

Table 1
Examples of organizing activities for digital servitization.

Theme	Representative quotes
Relational embeddedness	“I think now in this digitalization, nobody can solve it by themselves, that’s clear. So now, I’ve been having this collaboration lab where they have the customers, and there all the relevant [firms within the MNC] are participating.” [Apparatus, Global Service Product and R&D Manager] “You get more and more information and feedback from the customer (...). That tightens the relationships that we have with the customers thanks to the digitalization of services and that is helping the business, all lines of the business.” [Oceana, Global Sales & Business Development]
Structural embeddedness	“A couple of years ago, we tried to push [digital services] as a standard product and did not take care of the local environment at all—maybe that was not so successful, so actually the localization freedom has increased.” [Apparatus, Vice President, Service Owner] “[The digitalization] started in [Oceana], where we had an obvious pull from the technologies that would allow us [to access] this remote connection and to troubleshoot the things (...). So, this pull, this need, came from the business.” [Oceana, Product Manager]
Heritage	“One of the biggest benefits of our company is that it feels so like a local country organization because they have their own ways of working and everything, it then might frustrate if you try to manage this whole portfolio (laughs).” [Apparatus, Global Service Product Manager] “Just before we started developing the [digital] services, we centralized very much this new business into these couple of places, where we’ve also had strong service business, even before.” [Oceana, Executive Business Unit Manager]
Resources	“A lot of problems we’re facing are stuff like getting the IT working. (...) How to get this connection up and running takes days if you don’t know what you’re doing and you’re discussing with the customer, so I think that this is very challenging.” [Apparatus, Remote Support Operations Manager] “For all the years we had big problems with [a local organization], (...) they really depended on the help from other countries, and they didn’t seem to get it. Then we implemented the new [digital] system, and now (...) they have access to the expertise and support from the whole big organization.” [Oceana, Senior Vice President (Collaborative Operations)]
Control	“[Local organizations] are managing customer contacts. But, of course, then we have this cloud system and control of what is visible on that user interface, so in that sense, we can also control those contracts, and we really make sure that some money is flowing.” [Apparatus, Global Service Product Manager] “We have global project management and execution way of thinking, we’re not regional. We have global sales processes. Our contractual customers, they’re competing all around the world, so we need to have global transparency.” [Oceana, Senior Vice President (Global Operations)]
Front-/back-end coupling	“[Local organizations] are involved with their local language and so on at the front-end, and we [the central organization] at the back-end are supporting them, so we give tools, we give cloud, we give expertise, and we help them to do their business.” [Apparatus, Global Service Product Manager] “Because we were at an early stage with [front-end] IoT and these [digital service] centers, we didn’t yet fully know or understand what we could do, we were learning. It took a bit of time for the organization to better understand that we need to do the same in the back office.” [Oceana, Senior Vice President (Global Operations)]
Product/service unit coupling	“It has so much load, the [word] ‘service’, and people have different understandings, and all kinds of old stuff comes to the table. And really, I think especially in digitalization, it actually fits. (...) So that thing [digital service] wouldn’t exist without that equipment, at least in this company” [Apparatus, Head of Global Service Product and R&D] “We created this [centralized digital solutions unit] to be a central link between service and product development. And [different teams] can benefit from other software development we have, the smart algorithms, platforms, software development methods.” [Oceana, Senior Vice President (Information & Control)]

then, Oceana's external ecosystem was more complex, in addition encompassing system designers, standards organizations, government institutions, and industry organizations (see Fig. 2b). Within this ecosystem, digital services quickly became the key differentiator for customers when choosing a supplier. As in the case of Apparatus, Oceana's managers emphasized the importance of trust. As one informant explained, the novel and intangible nature of digital offerings prompted Oceana to increase transparency—for example, by creating “common platforms” for sharing customer feedback and other information. This change “boosted the relationship with the customer,” which became “more of a partnership.” To support this transformation, Oceana sought to enhance ICT-enabled information and knowledge

exchange with its MNC partners, as well as between its central and local organizations.

The findings indicate major differences between the two firm's ecosystems. Unlike Apparatus, Oceana's digital servitization efforts were strongly affected by industry organizations (e.g., trade-specific associations) and government institutions (e.g., the European Union). For example, the introduction of global safety rules in the aftermath of a major industry accident led to increased customer demand for safety-related digital services, causing Oceana to refocus its service development efforts. Similarly, stricter rules on energy efficiency meant that digital monitoring became a significant customer concern, prompting Oceana to concentrate on service offerings that addressed issues such as

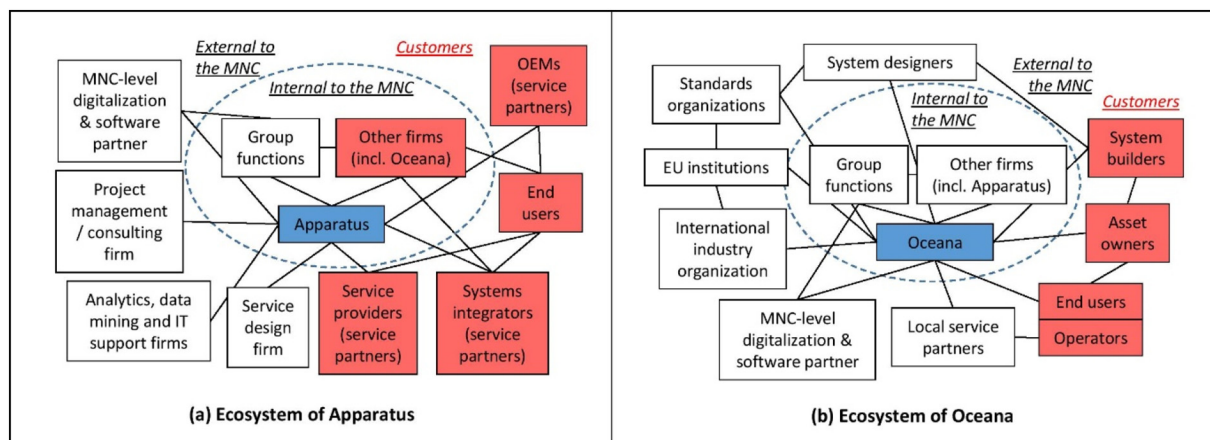


Fig. 2. Ecosystems of the focal firms.

fuel savings and emission reductions. At the same time, highly volatile market conditions across customer segments increased readiness within the ecosystem to invest in digitalization, enabling Oceana “to penetrate the market with innovation” of its digital services.

The two ecosystems also differed significantly in terms of their organizing efforts. Top management at Apparatus did not establish an overall vision for its digital servitization strategy, which slowed acceptance of digital offerings across the firm's local organizations, as there was no “clear understanding” of the transformation's “full picture.” For example, although Apparatus created a roadmap for the development of digital services, this was only employed internally and was not widely shared with external actors. In contrast, implementation of Oceana's digital servitization strategy was based on agreement among the firm's key decision-makers and was communicated to the main actors within and outside the MNC. This included publication of a vision-setting white paper co-authored by key individuals across functions and units. The views expressed in that document were accepted within Oceana and became “the firm's strategy.” As a result, Oceana was able to promote its vision across the ecosystem, establishing itself as an industry pioneer in digital servitization to the extent that even standards organizations sought Oceana's expertise when formulating industry-wide rules and regulations for selected digital services.

4.2. Centralization

Our findings indicate that Apparatus' and Oceana's differing approaches to digital servitization relate to the centralization of organizational structures. In this regard, differences in administrative heritage were a key element. One senior manager noted that Apparatus was traditionally “not global at all” despite the presence of a global organization, highlighting the independence of the firm's local organizations. Instead, Oceana concentrated on offering main service categories globally and was unique among the MNC's firms by the minimal role of its regional and local strategies. Although local organizations had greater freedom in the past, managers leading the transformation perceived that Oceana had “always been global.”

Subsequent changes in both firms also differed considerably. Although Apparatus implemented a global and standardized digital service strategy, the traditional independence of local units remained unchanged. For example, one respondent described managing the digital service portfolio globally as “frustrating,” and several managers felt that many local and regional units lacked the necessary resources to meet the demands of digital servitization, suggesting that Apparatus should instead work “in a more centralized manner.” Despite this perceived need to centralize the organizational structure, no comprehensive restructuring was undertaken. Nevertheless, the findings indicate certain advances in this direction. As one senior manager explained, digitalization allowed the firm to “scale up and really productize” digital services and tools that were previously localized as “part of customer relationships.” By supporting local units with ICT-based training for digital offerings, the central organization also facilitated the exchange of technological skills and knowledge. In addition, the centralized cloud system and user interface allowed Apparatus' central management to access customer and service contracts that had previously been handled exclusively at local level, and this development contributed positively to the firm's digital servitization efforts.

In contrast to Apparatus, Oceana's profound transformation of the organizational structure became imperative as a result of digitalization-related pressures from its ecosystem; “with IT architecture, harmonization, and common tools, every larger company is trying to become more efficient in the backbone,” making customer decision-making processes “even more centralized.” These changes in the ecosystem demanded global efficiency in Oceana's service operations, prompting comprehensive centralization initiatives that resulted in an entirely new organizational structure. For example, Oceana centralized its core IT resources in two physical locations and created “common resource

pools” through a global fund to support digital servitization. This centralization was crucial as Oceana sought to address growing customer demands in relation to data quality, cyber security, common software platforms, and data-related skills.

Beyond centralization, Oceana made further structural changes to maintain a local presence as customers' installed base relocated from Europe to Asia. To ensure that the central organization would maintain control, Oceana built digital service centers in several critical locations worldwide. As a physical manifestation of the firm's digitalization efforts, these centers provided the central organization with remote real-time access to the installed base while offering customers 24/7 support. This initiative consolidated employees' firsthand experience of Oceana's digital services, which helped to scale up the service-centric mindset, management structures, practices, and routines across the firm and greatly enhanced the firm's digital servitization efforts.

4.3. Integration

Our findings also suggest that the differences between Apparatus and Oceana in organizing for digital servitization reflected varying degrees of integration when changing the organizational structure. For Apparatus, the service organization was transformed into a standalone entity, with its own profit and loss responsibility, whereas the service function had previously played a supporting role in relation to products. Separation of the service function challenged long-established beliefs concerning the dominant role of products, prompting a sometimes unfavorable attitude to the service organization's new status. Although employees gradually acknowledged the change, the service organization experienced ongoing difficulty in developing digital services to support Apparatus' products, as for example when developing connectivity-based services for remotely connected equipment.

In Oceana's case, the transformation was grounded in a new vision of service-centricity. This new mindset was reinforced by management's emphasis on compatibility of digital services and integrated products, which are electrical rather than mechanical, and “there are bits and bytes involved.” To support this change of mindset, Oceana's top management established a centralized digital software and solutions unit as “a central link between service and product development.”

As part of the digital servitization efforts, Oceana's move toward service centricity entailed a new focus on software. The firm concentrated increasingly on digital services and solutions that were independent from the MNC's products and thus were “software-centric” rather than “hardware-centric”. By focusing on software, Oceana was moving into “a whole other service industry”—an extension of a market that previously focused on hardware-centric services. To access this larger market, Oceana increased collaboration with local partners and began working with other actors to integrate their own and the firm's software, as well as created a digital platform for information sharing. These organizing efforts entirely surpassed those of Apparatus, where digital services “would not exist” without the firm's equipment.

Regarding front- and back-office roles in digital servitization, Apparatus' central organization had more back-end responsibilities than local organizations. The firm's global service managers promoted digital services across local organizations and provided training, as well as digital tools and expertise. Local organizations played a more front-end role and interacted directly with customers in adapting digital services to their respective markets, although R&D managers in the central service organization also received a customer interface through the digital platform.

At Oceana, digital servitization involved a more profound transformation of both front- and back-end roles—for example, the establishment of digital service centers worldwide created a single digital front-end. In parallel, user interfaces were integrated to provide customers with a unified experience of digital services, echoed in the umbrella rebranding of Oceana's digital offerings. After successfully transforming the digital front-end, top management recognized the

need “to do the same in the back office” and initiated major back-end changes to integrate back-office functions. These initiatives further consolidated digital servitization by allowing the firm to “manage the data in a well-structured manner” and to “make all information interconnected.”

5. Discussion

5.1. Ecosystem actors and activities

While embeddedness within their ecosystems was a factor in both firms' efforts to organize for digital servitization, Apparatus and Oceana differed significantly in their respective approaches. Oceana's structural embeddedness was affected by the growing influence of global rules and regulations, increased interest in digitalization as a response to critical incidents (e.g., cyber security threats), and standards organizations initiating various digitalization initiatives. To address these changes in the ecosystem, Oceana transformed their own organizational structure. In contrast, Apparatus' service ecosystem was less profoundly affected by external change. This aligns with existing evidence that demand-based factors linked to environment (e.g., customer cost savings) are key drivers of servitization across industries (see for example [Matthyssens & Vandenbempt, 2010](#); [Raddats, Baines, Burton, Story, & Zolkiewski, 2016](#)). Notably, in contrast to [Raddats et al.'s \(2016\)](#) finding that competitive factors are seldom the main driver for systems integrators, external factors were crucial for Oceana. We contend that the digital side of servitization explains these differences, as different types of actors simultaneously invest in digital servitization to enhance their competitive position and to strengthen customer relationships.

Changes in the competitive landscape caused by digital servitization were especially clear in the case of Oceana. Digitalization can align ecosystem actors to improve coordination and generate further collaboration between established partners, fostering new service and collaboration opportunities among a diverse set of actors. Not only Oceana and its traditional direct competitors, but also ship designers, engine manufacturers, and pure software firms moved to varying degrees into the same software-centric service domain. In this way, digitalization can strengthen both relational and structural embeddedness by strengthening established relationships and facilitating new ones. In line with industrial network theory (e.g., [Möller & Svahn, 2009](#)), we contend that digital servitization depends on a unified vision and goals if it is to benefit the focal firm, customers, and other key actors within the ecosystem. Beyond the new technology and tools associated with digitization, digitalization requires new organizational procedures and guidelines that demand structural change. This change in turn requires a profound understanding of the ecosystem and the ability to influence it, as well as the willingness and capacity to transform internal organizational structures ([Kowalkowski & Ulaga, 2017](#)). In this regard, internal buy-in and support is crucial in driving transformation ([Kotter, 1995](#)), as evident in Oceana's more comprehensive approach to digital servitization.

5.2. Centralized decision-making and intrafirm integration

Although the two case firms were part of the same MNC, differences in administrative heritage exerted a strong influence on change processes and the approach to digital servitization. A heritage of strong local organizations and more fragmented service operations inhibited Apparatus' first attempts at global digital servitization. In contrast, Oceana transferred control from local units to central management, enabling the successful implementation of global digital service initiatives. This increased control over the firm's (internal) ecosystem shifted the focus from external to internal embeddedness, thereby enhancing Oceana's organizing capacity (cf. [Ghoshal & Nohria, 1989](#)). Oceana's overall decision-making processes also became increasingly centralized when customer interaction moved to a higher managerial

level, involving customers' top management in major digitalization-related decisions. While existing evidence suggests that more complex solutions ([Davies et al., 2006](#)) and more multinational service agreements ([Kowalkowski et al., 2011](#)) demand increased central coordination, our findings point in the same direction regarding the digital side of servitization. Digitalization-specific drivers include the need for a uniform software platform, consistent data quality, and cyber security. A scarcity of human resources (e.g., data scientists) means that these must be concentrated centrally and in group-level R&D functions.

The findings also revealed considerable differences between the two firms in terms of the interplay of resources and digital servitization. For Apparatus, the technology supported the scalability of digital services across local organizations, allowing the central organization to support them and to acquire control over customer relationships. However, the firm did not take any significant steps toward centralization, and critical IT competences were scarce at local and regional levels, hindering digital servitization efforts. In contrast, Oceana implemented comprehensive centralization initiatives such as the creation of “common resource pools” and introduction of key IT competences. These initiatives allowed Oceana's top management to control and subsequently sustain digital servitization while ensuring a local presence to address changes in the ecosystem (i.e., relocation of customers' installed base).

The case firms also differed at management level in their handling of the outcomes of product and service separation. At Apparatus, joint initiatives with product units remained somewhat challenging, especially when organizing for digital servitization. While Oceana's service organization initially encountered similar resistance, management's wide-ranging measures—for example, creating a centralized digital software and solutions unit for consolidated service and product development—led to the successful implementation of digital servitization initiatives. Moving into software-centric digital services independent of the MNC's products enabled Oceana to further extend its organizing efforts.

Our findings show that in balancing service and product centrality, the two firms differed in their emphasis on front- and back-end roles, supporting the conclusion that different configurations can exist within a single firm ([Raja et al., 2018](#)). Digital servitization at Apparatus was on a smaller scale and mainly involved assigning front-end roles to local organizations and back-end roles to central units. This aligns with existing evidence (e.g., [Cenamor et al., 2017](#)) that front-end units handle localization. However, while close involvement of local organizations with customers might prove advantageous, Apparatus experienced difficulties in global organization of its portfolio of digital services, mainly because of a lack of comprehensive integration and interconnection of front-end and back-office functions. In contrast, these initiatives helped Oceana to organize for digital servitization.

In summary, while it is possible to servitize without digitizing the offering, and it is possible to digitize the offering without offering it as a service, the interplay between digitalization and servitization is very strong ([Lerch & Gotsch, 2015](#)). Although the two are separate processes, our findings show that they are intertwined and in practice interdependent. As evident in both cases, digital servitization was entangled in the ecosystem and was enabled by centralization, embeddedness, and integration. [Table 2](#) summarizes the key contingency factors and organizing activities for digital servitization.

6. Implications and limitations

6.1. Implications for theory

The present study contributes to the research on organizing for digital servitization by disentangling the underlying processes of organizational change in the ecosystem. Our findings indicate that enhanced relational and structural embeddedness are driven by increased demand for efficiency in the market and closer collaboration among ecosystem actors. Simultaneously, centrally managed digitalization facilitates

Table 2
Key contingency factors and organizing activities for digital servitization.

Theme	Contingency factors	Organizing activities
Embeddedness	<ul style="list-style-type: none"> ● Market dynamics, rules, and competition ● Ecosystem characteristics ● Position in the ecosystem ● Digitalization-related issues and expectations 	<ul style="list-style-type: none"> ● Close collaboration with internal and external parties for digital servitization, given the high dynamism and complexity of digitalization. ● Setting out a comprehensive vision for digital servitization prepares employees for change and brings key stakeholders on board. ● Sharing knowledge and information via digital platforms further supports trust and continuous interaction across parties.
Centralization	<ul style="list-style-type: none"> ● Administrative heritage of operating and organizing globally ● Local organizations' competences and degrees of freedom ● Intrafirm readiness for transformation 	<ul style="list-style-type: none"> ● Centralized decision-making and strategies scale up digital servitization through maintaining management structures, practices and routines. ● Ensuring that critical IT competences are available locally requires their global centralization. ● Sharing digital tools and resource pools across the firm for transparency, benchmarking, and comprehensive digital servitization initiatives.
Integration	<ul style="list-style-type: none"> ● Separation, power, and collaboration of product and service organizations ● Front-end and back-end roles and responsibilities ● Prevailing product-centric or service-centric mindset 	<ul style="list-style-type: none"> ● Achieving scalability of technologies enables digital servitization across the firm. ● Front-end integration through creation of digital centers with global customer support allows all customer-facing technology to be unified. ● Integration of back-office functions and roles allows structuring of data and interconnection of information across the firm. ● Close collaboration between service and product organizations and consolidation of their R&D efforts enable digital servitization. ● Moving toward software independence from the firm's products extends the scope of digital servitization.

additional engagement with actors in the ecosystem, strengthening interfirm and intrafirm integration. Ecosystem characteristics and the firm's administrative heritage and position in that service ecosystem (e.g., as a systems integrator or product supplier) serve to condition digital transformation.

First, this study illuminates the role of centralization of decision-making in digital servitization. According to the extant literature, product-centric firms that pursue servitization typically need to place more emphasis on local service operations and organization (Fischer et al., 2012) and on decentralization of decision-making authority to lower-level managers (Eggert, Hogreve, Ulaga, & Muenkhoff, 2014; Neu & Brown, 2005). There is also evidence that a stronger central entity is needed to support coupling between back-end product and service units and local customer-facing units (Davies et al., 2006; Raddats & Burton, 2011). Our findings suggest that standardized service processes and increased centralization and control are essential for digital servitization, with further support from extensive IT resources. We also found that centralization of decision-making authority enhanced both global efficiency and responsiveness to customer needs. The required commonality of digital platforms and customer interfaces across segments and markets also demands closer intrafirm integration, and a service-centric mindset is critical in securing the benefits of digital servitization.

Second, these findings show that digitalization enables firms to reconfigure their service business. Services that previously required local presence and a high degree of customer interaction not only can make increasing use of back-end units (Fischer et al., 2012); new services become increasingly software-centric. This dematerialization of resources (Normann, 2001) indicates less dependence on local front-end units. If digital servitization is envisaged as a strategic, firm-wide transformation, the required IT resources are seldom available at local level because of the considerable investments and competences needed. Closer coupling between front- and back-end and between product and service units facilitates the stronger integration required for global efficiency and standardization of service operations.

6.2. Implications for practice

From a managerial perspective, the present study provides insights into the profound effects of digital servitization on product firms' competitive advantage, regardless of industry. First, digital service transformation requires firms to take a more holistic perspective of their service business and strategy. While manufacturing and

conventional R&D activities can be centrally managed to achieve global efficiency and standardization, services require increased local responsiveness and closer customer relationships. For more advanced services and solutions, greater integration is needed between central and local units and product and service units. During digitalization, the central organization must take a more proactive leading role to ensure software platform consistency and data quality, to address cyber security issues, to provide the requisite data science skills (e.g., analytics, algorithms), and to support local units. For that reason, while servitization is a largely incremental (Kowalkowski, Kindström, Brashear Alejandro, Brege, & Biggemann, 2012) and emergent (Palo, Åkesson, & Löfberg, 2018) process in many firms, the digital dimension of change requires more purposeful and coordinated effort. Overall, the centralized organizational structure must accommodate both exploitation and exploration of digital service capabilities. While central units need to ensure the availability of digital resources and capabilities, too much centralization can impede service innovation and local adaptation. It follows that successful centralization depends on central-local integration that enables better resource allocation and local support.

Second, it is important to emphasize the difference between digitization (turning analog into digital) and digitalization (using digital technology to change the business model). A tech-savvy firm with a product-centric mindset may have little difficulty in implementing digitization, as when record companies moved from LPs to CDs. However, while such initiatives strengthen the product business, there is a risk of limiting the focus to service infusion and digitization rather than embracing servitization through digitalization. A predominantly product-centric mindset is likely to prove highly problematic when digital services substitute product purchases or significantly extend the product's lifetime, which is likely to increase the tensions between product and service units. That being so, it becomes crucial to navigate the internal political landscape and to communicate the change process clearly.

Third, digitalization is also likely to disrupt ecosystems in industries typically perceived as traditional or conservative. Competition based on digital services and platforms includes other subsystem suppliers not traditionally regarded as direct competitors. That competition is by no means limited to product firms; customers increasingly expect that a single provider will integrate the system of which the products are part, and that they will do so through one digital interface (e.g., a software platform). As well as other manufacturers, then, various hardware and software firms are likely to become competitors. As we observed in the case of Oceana, competition may also come from more unexpected sources, as for example when one of the leading international standards

organizations moved into platform-based digital services. To avoid becoming a sub-supplier to a new type of systems integrator, product firms must therefore have the requisite digitalization capabilities to cope with these new forms of competition and to strengthen customer interfaces.

6.3. Limitations and further research

This study has a number of limitations that invite further research. First, to gain a deeper insight into digitalization and digital disruption, future studies might usefully integrate marketing research and information systems research, which is increasingly concerned with service innovation and ecosystems (e.g., Lusch & Nambisan, 2015). As noted by Breidbach et al. (2018), companies will increasingly be required to facilitate the flexible orchestration of complex arrangements of people and technologies for value creation. In this context, the changing role of technology and the blurring of boundaries between humans and technology in service ecosystems calls for further collaborative team science, such as interdisciplinary and transdisciplinary research. Second, the two cases described here concentrate on a single focal actor in each ecosystem. While this actor-network delimitation facilitates theory development (Halinen & Törnroos, 2005), it should be complemented by studies that draw on primary data from multiple

actors—for example, service partners, which many firms rely on (Kowalkowski & Ulaga, 2017). Longitudinal network research would provide additional insights into the evolution of ecosystems. Third, as more firms pursue digital servitization, quantitative methods could be used to evaluate the effectiveness of centralized expertise decision-making, to investigate the effects of country and cultural heterogeneities, and to assess the influence of focal firms on their ecosystems. Finally, while the two ecosystems explored here represent one highly dynamic and one moderately dynamic market, further research should assess the interplay between various ecosystem characteristics and digital servitization initiatives.

Declarations of interest

None.

Acknowledgements

Christian Kowalkowski, Bård Tronvoll, and David Sörhammar acknowledge the support of Riksbankens Jubileumsfond (The Swedish Foundation for Humanities and Social Sciences) (research grant number: P15-0232:1).

Appendix A. Interview study sample

Informant	Time per interview (hours and minutes)			
Apparatus				
Coordinator of Service Development	01:24			
Global Service Product and R&D Manager	01:24			
Global Service Product Manager	01:03	00:41	01:03	01:04
Head of Global Service Product and R&D	01:25			
Innovation & Venture Program Manager	01:30	01:03		
Project Information Manager	01:29			
Project Manager	01:30			
R&D Project Manager	01:36			
Remote Support Operations Manager	00:38			
Service Product Manager	01:30	01:43	01:03	
Vice President, Service Owner	00:28	00:37		
Oceana				
Analyst (Customer Service)	01:12	02:08		
Analyst (Customer Service)	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		03:20	
Vice President (Head of Global Services)	01:08	01:38		
Vice President (Local Region)	01:41			
Vice President (Service)	01:41			
Corporate functions				

Embedded Systems Coordinator	01:26
Project Manager, Corporate Research	01:30
Senior Scientist (Industrial software systems)	01:30
User Experience & Industrial Design	01:30

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