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# Paths to Service Capability Development for Servitization: Examining an Internal Service Ecosystem

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# **PATHS TO SERVICE CAPABILITY DEVELOPMENT FOR SERVITIZATION: EXAMINING AN INTERNAL SERVICE ECOSYSTEM**

## **Abstract**

There is a need to examine the internal service ecosystem perspective to understand how the capability development process unfolds. To achieve this, an embedded case study of ten subsidiaries of a large multinational capital equipment manufacturer was conducted to analyze how front- and back-office capability development progresses across the subsidiaries. Three different paths for capability development were identified, indicating: (i) the sequential development of capabilities and capability renewal; (ii) difficulties of capability replication; and (iii) capability retrenchment and service dilution. It is argued that a lack of interaction between the front- and back-office may constrain progress in terms of realizing efficiencies through the standardization of offerings, processes, and performance measures. Important managerial implications indicate the need to manage an internal service ecosystem that allows for capability replication, which requires a strong center to leverage learning.

**Keywords:** servitization, service capability development, internal service ecosystem; front- and back-office

## **1. Introduction**

The servitization of manufacturing—the shift from selling products to providing customer-centric services and solutions—has become a widespread strategy used to increase the competitiveness of manufacturing firms (Vandermerwe & Rada, 1988; Kowalkowski et al., 2017; Raja et al., 2013; Tuli et al., 2007). As research in this field continues to increase, a number of studies have begun to examine servitization from an ecosystem perspective (Reim et al., 2019; Parida et al., 2019; Bustinza et al., 2019), meaning there has been an examination of the different actors that collaborate (e.g. service partners, suppliers, distributors, and customers) together to realize a servitization strategy; however, there is still a need for a deeper understanding of the internal ecosystem and capabilities of large global organizations. To the best of the authors' knowledge, few notable studies exist that explicitly address the internal ecosystem (Baik et al., 2019; Hullova et al., 2019; Sklyar et al., 2019) and the process of front- and back-office capability development (Valtakoski & Witell, 2018). The aim of this study was to expand on these studies by examining an internal service ecosystem as well as how the front- and back-office capability development process unfolds.

Within the broader strategy literature, capabilities have been extensively studied (see, for example, Amit & Schoemaker, 1993; Helfat & Peteraf, 2003; Teece et al., 1997; Teece, 2007). Drawing on this literature to varying degrees within the context of servitization, a number of notable studies have been conducted that have considered the different capabilities required (e.g., Davies, 2004; Gebauer et al., 2012; Kindström & Kowalkowski, 2014; Paiola et al., 2013; Raddats et al., 2017; Story et al., 2017; Ulaga & Reinartz, 2011); however, several aspects remain unclear regarding the internal ecosystem of servitizing firms. First, in the extant literature, two opposing views exist regarding the process of service capability development in terms of the front- and back-office. The literature lacks a consensus as to whether the back-office service capability should precede the development of customer facing, meaning front-office service capability, or vice versa (Valtakoski & Witell, 2018). Prior research has advocated that the development of capabilities on the front-end customer interface be given priority (Sawhney, 2006; Davies et al., 2006). Contrarily, others advocate focusing on the back-end service process standardization capabilities and suggest that they should precede the development of customer-facing capabilities (Kowalkowski et al., 2015; Oliva & Kallenberg, 2003). Second, although considerable knowledge has been obtained related to the different types of capabilities required, there is a need to extend this knowledge and to examine the interactions among different capabilities (Rönnerberg et al., 2016; Wu et al., 2012). In particular, there is a paucity of studies examining the interactions between front- and back-office service capabilities (Valtakoski & Witell, 2018). Based on the literature, interactions amongst different capabilities can have enhancing but also suppressing effects (Black & Boal, 1994; Rönnerberg et al., 2016), though the way this progresses in a servitization context requires further research.

In this study, the internal ecosystem of one large established multinational manufacturer transitioning towards servitization was investigated by examining ten of its subsidiaries using a qualitative approach to understand the process of capability development. Based on the findings, three paths to capability development across the different subsidiaries were identified, indicating (i) the sequential development of capabilities and capability renewal; (ii) the difficulties of capability replication; and (iii) capability retrenchment and service dilution. In doing so, we demonstrate how the interactions between front- and back-office capabilities has implications for transitioning towards servitization.

This study makes important theoretical contributions to the literature. The first contribution is demonstrating how capability development unfolds using Helfat and Peteraf's (2003) capability lifecycle stages for service development in a large global firm across subsidiaries. In doing so, a sequential approach to capability development was identified as being the most conducive path for transitioning to advanced service provision and capability renewal. The second contribution points towards the difficulties in replicating capabilities across subsidiaries. Moreover, the understanding of this process has been enhanced by unpacking the interactions (or lack of) in the internal service ecosystem between the front- and back-office, revealing that limited interactions prevent reaching the capability maturity stage, which constrains progress in terms of realizing efficiencies through the standardization of offerings, processes, and performance measures. The third contribution is related to the difficulties of simultaneously attempting to develop front- and back-office capabilities. It is proposed that this may lead to capability retrenchment and may explain why firms curtail service provision.

This paper is structured as follows. Next, a review of the literature on servitization and capabilities is provided followed by the research methodology in Section 3. Section 4 presents the findings of this study along the three paths to capability development identified. Section 5 presents the discussion of the findings, details related to theoretical and managerial implications, and suggestions for future research.

## **2. Theoretical background**

### **2.1. The transition to - and classification of - services**

Early research in the domain of servitization advocates that traditional manufacturers provide services as a renewed means of competitiveness (see Vandermerve & Rada, 1988; Wise & Baumgartner, 1999). This was followed by studies that discuss the need for organizations to transition from delivering products to increasing service elements to providing full-fledged solutions and outcomes (Oliva & Kallenberg, 2003; Tukker, 2004). These studies tend to propose a fairly linear path in transitioning towards services; however, more recently, others have argued that the journey towards servitization is more nuanced and that there are numerous trajectories available for firms pursuing services (Kowalkowski et al., 2015; Parida et al., 2014; Raja et al., 2017). Furthermore, some researchers have begun exploring the transition from an ecosystem perspective (Reim et al., 2019; Sklyar et al. 2019; Bustinza et al., 2019).

To understand the transition to services, it is necessary to examine the different types of services provided. In the extant literature, there are numerous different classifications of the different types of services manufacturers may provide. Many of these studies suggest a progression from simpler to more advanced services. Commonly cited classifications include product-, use-, and result-oriented services (Mont, 2002; Tukker, 2004); smoothing, adapting, and substituting services (Cusumano et al., 2015); customer service, basic service, maintenance services, R&D-oriented services, and operational services (Geabuar et al., 2010); and base, intermediate, and advanced services (Baines and Lightfoot, 2013). The latter classification is explained in more detail in the next paragraph.

*Base (also referred to as basic) services* have traditionally been provided by manufacturers based on their production competence, such as spare parts to ensure the functioning of equipment (Lele, 1986; Goffin & New, 2001). Moreover, such services have been an important source of revenue for manufacturers with higher profit margins relative to products (Cohen et al., 2006). Goffin and New (2001) identified seven types of aftersales services: installation, user training, documentation, maintenance and repair, online support, warranty, and upgrades. Base services are typically considered those that are product-oriented, standardized, and traded in a

transactional way (Uлага & Reinartz, 2011). In other words, base services are input-based and oriented towards the product (Kowalkowski & Uлага, 2017).

*Intermediate services* focus on the maintenance of the product to maximize the product's operational use, such as scheduled maintenance and overhaul services (Baines & Lightfoot, 2013). Manufacturers often seek to support their installed base of equipment over the entire lifecycle, so these services are also conceptualized as lifecycle service offerings (Rabetino et al., 2015). Uлага and Reinartz (2011: 15) defined product lifecycle services as "services that facilitate the customer's access to the manufacturer's goods and ensure its proper functioning during all stages of its lifecycle, whether before, during, or after its sale." Intermediate services usually capture the higher portion of service potential by complementing spare parts with other services that include service labor (Jovanovic et al., 2016; Visnjic et al., 2018).

Lastly, *advanced services* focus on capability delivery and include becoming an availability and/or performance provider (Kowalkowski et al., 2015). Moreover, such services are delivered on the basis of risk and revenue sharing (Gebauer et al., 2017). A commonly cited example includes Rolls Royce and its concept of "power-by-the-hour." Advanced services help manage the customer's processes more broadly to include more than the product (Mathieu, 2001). Advanced services are also classified as process delegation services because the provider performs processes on behalf of the customer (Kowalkowski & Uлага, 2017). Advanced services underline the outcome rather than prescribing how it will be delivered (Kim et al., 2007). In this respect, some scholars make a distinction between asset efficiency services (focused on the performance outcome) and process support services (focused on the customer's process) (Kowalkowski & Uлага, 2017; Uлага & Reinartz, 2011).

Although the transition to servitization-based business models has substantially increased, it is worth noting that some studies have also begun addressing the issue of deservitization (Finne et al., 2013; Valtakoski 2017), which refers to firms that have decided to move away from services completely or to reduce the role of services via service dilution (Kowalkowski et al., 2017); however, this remains an area of research that is understudied and not well understood.

Next, the capabilities necessary for the development and delivery of such services are discussed.

## **2.2. Capability development**

### **2.2.1. Organizational capabilities**

The organizational capabilities literature has received considerable attention in the broader strategy domain over time (Amit & Schoemaker, 1993; Teece et al., 1997). Organizational capability is said to refer to "the ability of an organization to perform a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving a particular end result" (Helfat & Peteraf, 2003, p. 999). Organizations develop such capabilities by assembling the available resources into specific and unique configurations so that the input is transformed into an output of greater worth (Amit & Schoemaker, 1993).

In the broader literature, there are discussions of mainly two types of capabilities: dynamic and operational. The literature on dynamic capabilities argues that it is not necessarily the organization's resources that are important but rather its ability to reconfigure routines for changing environments (Teece & Pisano, 1994; Teece et al., 1997). Dynamic capabilities are those that "enable business enterprises to create, deploy, and protect the intangible assets that support superior long-run business performance" and can be separated into three important components: sensing, seizing, and transforming (Teece, 2007, p. 1319). An operational capability is defined as something that "enables a firm to perform an activity on an on-going basis using more or less the same techniques on the same scale to support existing products and services for the same customer population" (Helfat & Winter, 2011, p. 1244) and is often described as how you earn your living in the present (Helfat & Peteraf, 2003; Winter, 2003). This is in contrast to dynamic capabilities, which are considered to "enable a firm to alter how it currently makes its living" by changing operational routines (Helfat & Winter, 2011, p. 1244).

In their often-cited paper, Helfat and Peteraf (2003) argue that just as products have recognizable stages of growth, maturity, and decline, capabilities have development paths. Regarding capability development, they propose three stages. The *founding stage* is said to form the basis for the development of the capability. This is followed by the *development stage*, where the capability is progressively advanced. Finally, capability building ceases at the *maturity stage*. Further evolution of a capability is possible, as it is proposed that they may branch into one of potentially six additional stages: retirement (death), retrenchment, renewal, replication, redeployment, and recombination (Helfat & Peteraf, 2003).

### 2.2.2. *Capabilities for servitization*

The servitization domain has extensively drawn on the capability literature to understand the types of capabilities necessary for developing and delivering services (see Table 1 for an overview). The literature has drawn on both dynamic and operational capability concepts. For example, Gebauer (2011) conceptualizes dynamic capabilities in a novel way as a management innovation used to reconfigure operational routines in product firms for the service capabilities of innovating, selling, and delivering. Other notable studies include (Kindstrom et al., 2013; Fischer et al., 2010 – see Table 1 for details of capabilities identified) those that explore the micro-foundations of dynamic capabilities using the sensing, seizing, and transforming framework of Teece (2007). Also of note are the seven strategic capabilities identified by Huikkola and Kohtamaki (2017).

Most studies provide a detailed account of the different types of operational capabilities for developing and delivering servitization. A fairly comprehensive set of service innovation capabilities are presented by Kindstrom and Kowalkowski (2014) based on the different elements of a business model. Extending other studies by adopting a multi-actor approach, Story et al. (2017) identify manufacturer-, intermediary-, and customer-specific capabilities; however, it is not clearly discernible whether the capabilities identified in these studies pertain to different levels of service (i.e., base, intermediate, and advanced).

Solutions are considered an advanced service offering because they are focused on addressing a specific customer need (Tuli et al., 2007) and potentially delivering a specified outcome (Visnjic et al., 2017). For solutions, Storbacka (2011) provides one of the most comprehensive lists of capabilities in identifying 12 capability categories that include 64 different capabilities and management practices for solutions. Other studies pertaining to solutions are said to require four specific capabilities: systems integration, operational services, business consultancy, and financing (Davies, 2004; Davies et al., 2006).

It is noteworthy that most studies tend to be case studies based predominately on qualitative interviews, with some notable exceptions using surveys (Valtakoski & Witell, 2018; Parida et al., 2014; see Table 1 for details). It could be argued that this shows that the servitization domain is still at an exploratory stage in identifying the necessary capabilities as well as how they develop. In line with Rönnerberg et al., (2016), it is highlighted that the extant studies do not extensively focus on the process of capability development and interaction among different capabilities. Specifically, there is a need to investigate service capability development within the front- and back-office that are advocated in the broader servitization literature from an internal ecosystem perspective, which is discussed in the next section.

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INSERT TABLE 1 ABOUT HERE

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### 2.2.3. *Internal service ecosystems: examining the front- and back-office capabilities*

To create value, the interdependencies, complementarities, and coevolving capabilities needed amongst members in an ecosystem must be understood (Adner & Kapoor, 2010). Building on this, Adner (2017) defines the ecosystem “by the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize” (p. 42). As a first step, there is a need to understand the *internal ecosystem* and to make it more explicit within a servitization context (cf. Baik et al., 2019). To this end, the way front- and

back-office capabilities are developed as well as the interdependencies are important considerations for servitizing firms.

Previous research has shown that organizations such as ABB, Nokia, and IBM have “formed strong ‘front-end’ units responsible for developing and delivering integrated solutions, refocused product business units as ‘back-end’ supporters of solutions, and developed ‘strong centers’ to mediate between the two” (Foote et al., 2001, p. 90). Other have followed suit and have made suggestions along similar lines (cf. Galbraith, 2005; Davies et al., 2006; Sawhney, 2006; Storbacka, 2011; Oliva et al., 2012), and it is suggested that different design configurations may exist across divisions within a firm delivering services (Raja et al., 2018). On the other hand, there are some studies that suggest first consolidating product-related capabilities prior to embarking on investments in customer-facing service capabilities (Oliva & Kallenberg, 2003; Reinartz & Ulaga, 2008), which would permit firms to move from basic services toward more advanced services requiring front-end support (Ronnberg Sjodin et al., 2016). It is worth noting that these studies are predominately focused on design considerations for servitization. Table 2 provides a summary of some of the main studies on front- and back-end units.

Building on previous work, Valtakoski and Witell (2018) recently examined the front- and back-office (assuming “office” is akin to “-end unit” and used interchangeably) as specific *capabilities* consisting of organizational routines that are related to and influence service activities. They suggest that back-office service activities pertain to “the management of service demand and capacity, service operations, and human resource management” (Valtakoski & Witell, 2018, p. 1148) that are typically related to what Schmenner (1986) describes as a “service factory.” Front-office activities are said to be concerned with customization and adaptation across the customer interface in creating value for the customer and in increasing sales (Valtakoski & Witell, 2018). Although there is some knowledge related to service capability development from the extant literature, far less is known about the interaction between front- and back-office capabilities that a firm may develop for different types of services or how this evolves across the different capability development stages. Thus, for this study, the following research question was considered: *How does the process of service capabilities development and the interactions between the front- and back-office unfold?*

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### 3. Research Methodology

#### 3.1. Research approach and case background

For this research, a case study methodology was adopted using multiple embedded cases in a single organization (Eisenhardt, 1989; Voss et al., 2016). Given the research question, the aim was to explore how service capabilities unfold by adopting a multiple, embedded case design, which allows for theoretical replication and pattern matching (Yin, 2016) and exploring how capabilities evolve. Hence, a theoretical sampling approach (Eisenhardt & Graebner, 2007) was employed to identify (1) a manufacturer transitioning towards servitization and (2) developing service capabilities. To this end, a world-leading industrial manufacturer of capital equipment (referred to by the pseudonym “Servino”) that was developing its service business and ten of its subsidiaries were chosen. Servino has a history dating back over a century and still maintains a strong market leadership position within the construction and mining equipment industry.

Servino offers a range of different services that support its product offering across its different subsidiaries, varying in level of complexity from basic to intermediate to advanced. Typical basic services include spare parts, warranties, and ad-hoc repair. Intermediate services include scheduled maintenance, inspections, and overhauls, and advanced services include equipment optimization, consultancy, remote monitoring, preventative maintenance, and outcome-based contracts based on performance.

Servino's equipment has an extensive lifecycle, with internal calculations showing that the total lifecycle cost of equipment exceeded eight times the cost of the initial purchase. Hence, Servino's management was motivated to embrace the possibilities for growing the service business by offering a range of services beyond simply selling spare parts. The level of service provision varied across the different subsidiaries, with some having already successfully introduced advanced services for industrial equipment.

### 3.2 Data collection

A range of data collection techniques were utilized. The process began by negotiating access and conducting several initial interviews at the head office of Servino with the CEO and vice-president of services. Interviews across the different subsidiaries were then conducted with a range of employees. In addition, archival data and observations from visits to subsidiaries were utilized (Yin, 2016). The researchers were permitted freedom to select and to contact interviewees (Pratt, 2009). The Service Business Line Manager (SBLM) was interviewed first to obtain an overview of the service business in each of the subsidiaries, as they were responsible for resource allocation and coordination of the service business. Next, service technicians, product and service sales staff, service marketing staff, and technical support staff were interviewed. In addition, the subsidiary General Managers were interviewed. In total, 93 face-to-face interviews were conducted lasting approximately one hour each. On average, the visits to each of the ten subsidiaries lasted three days.

The interview protocol was designed in three main sections. First, all informants were asked to provide general information about their backgrounds, careers, and current roles in their respective subsidiary. Next, the researchers inquired about the history and development of the subsidiary to become familiar with it (Fontana & Frey, 1998). This was followed by questions pertaining to managerial actions related to services offered, roles, processes, structures, and personnel to assess how the subsidiary's capability profile had developed. This was done by examining how the service capability was founded and developed and whether it had reached maturity in the opinion of the respondents. Multiple informants were used to obtain as comprehensive a view as possible of the service capabilities deployed as well as to identify the path taken for service capability development. Given that respondents were asked to retrospectively explain the process of capability development, it was acknowledged that there are inherent disadvantages with memory recollection and post-rationalization. Hence, steps were taken to mitigate this by asking respondents to focus on the specific events, structural characteristics, and decision-making processes to reduce retrospective and cognitive bias (Miller et al., 1997; Miller & Salkind, 2001). In addition, accounts were corroborated with secondary sources where possible, and other respondents were probed on similar points to determine where there was convergence and divergence in accounts.

The vast majority of interviews were undertaken by at least two interviewers. The interviews were audio-recorded where consent was granted. On the odd occasion interviews could not be recorded, one researcher led the interview, while the other took extensive notes. As soon as possible after the interview, the notes were discussed amongst the researchers to ensure that an accurate as possible account of what was discussed had been captured. Steps were also taken to check the accuracy of the notes when a note was unclear or required further detail or clarification with the respondent either in person or via email. Table 1 provides an overview of the interviews conducted at each subsidiary.

Internal company documents were consulted when made available. These included business-review meeting presentations and minutes, service marketing materials, organizational charts and organograms, employee data, and financial reports for each subsidiary.

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INSERT TABLE 3 ABOUT HERE

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### 3.3 Data analysis

The interview transcripts were transcribed verbatim. In coding the data, the *tabula geminus* (or “twin slate”) approach was adopted rather than the *tabulae rasae* (or “clean slate”) approach (Kreiner, 2016). The twin slate approach, unlike the clean slate, permits theory into the coding process early on and incorporates it further as the research progresses during the theorizing process. Hence, this approach contains code labels that originate from the data *and* from existing theory (Kreiner et al, 2015).

Following this approach, the data was coded initially by hand by two researchers to identify codes and themes. This was followed by discussions to compare coding and to discuss discrepancies and emergent findings. The findings were written in an in-depth case study report, which formed the basis for subsequent discussions with interviewees to verify the accuracy of the findings. Each interview was thoroughly reviewed, with quotes and certain comments from the interview transcripts subsequently sorted into various codes and categories, which were identified from the literature and also emerged during the coding process. The authors first coded the interviews individually and then compared the coding results, thereby ensuring a high degree of inter-coder reliability (Miles & Huberman, 1994). This process involved a constant interplay between data collection and analysis based on how well the data fit the existing, modified, or emerging understanding and the relevance to the observed phenomenon (Huberman and Miles, 1994).

As mentioned, codes emerged from both existing theory and the interview process and were revised during the coding process. Helfat and Peteraf's (2003) capability lifecycle stages were used during the coding process to understand how service capability unfolded at each of the subsidiaries. Case histories were created to map the most important events related to changes in the service business for each subsidiary (e.g., hiring people, changing roles, and introducing new activities and processes), and *process maps* of the changes that occurred at each subsidiary were also created. In addition, the data were analyzed based on the front- and back-office capabilities by examining the routines and activities undertaken. In doing so, the coding categories in the front-office were identified as “frontline service operations,” “leveraging product sales for service,” “dedicated service sales,” and “service customization.” The back-office capability included the coding categories of “technical service support activities,” “service offering standardization,” “service process standardization,” and “service performance measures.” The understanding of the interactions between the front- and back-office capability categories emerged iteratively from an evolving review of the literature and the interviews. Consequently, using Helfat and Peteraf's (2003) capability development stages of founding, development, and maturity, three discernible paths (the aggregate dimensions of “capability renewal,” “difficulties of capability replication,” and “capability retrenchment and service dilution”) to service capability development were identified across the different subsidiaries (see Table 3), which are explained in detail in the findings section. Figure 1 provides the data structure from the analysis process (cf. Gioia, Corley, & Hamilton, 2013). Lastly, the repetition of information conveyed by respondents and the verification of the researchers' understanding during data collection and interviews was an indication that theoretical saturation was reached (Corbin and Strauss, 2015).

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INSERT FIGURE 1 ABOUT HERE

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## 4 Findings

The analysis of Servino's internal service ecosystem reveals a complex picture for capability development. The findings are organized according to the three different paths of capability development identified across the ten subsidiaries, detailing the extent of the evolution of the capability using Helfat and Peteraf's (2003) lifecycle stages, including the interactions between the front- and back-office capabilities.

## 4.2 Path I: Sequential capability development and capability renewal

*Founding stage:* The subsidiaries—Alpha, Beta, Zeta, Iota, and Kappa—that followed this path began with the provision of basic services, such as sales of spare parts and ad-hoc repairs that included labor costs. At this stage, the subsidiaries established a front-office capability that included *frontline service activities* and *leveraging on product sales* to push services to customers.

At these subsidiaries, hiring qualified frontline service technicians and training them to provide quality basic services to support customer needs was considered of paramount importance. Frontline service technicians were responsible for activities related to visiting the customer, repairing the equipment, and building customer relationships. In doing so, service technicians were able to develop trust with customers, which placed them in a strong position to promote the sale of basic services. For instance, one service manager explained the reasoning behind adding trained technicians for repair and maintenance: “*there are benefits to the customer because the product is correctly looked after by trained technicians. There’s less risk of the product breakdowns*” (Zeta). Similarly, another manager emphasized the role of frontline service technicians in not only building trust but also up-selling services during the product lifecycle: “*I think it makes just perfect sense that once they see, especially if you’re a good service provider, once they see that you know your equipment and you know their application, you can provide some practical hints. You can help them out of trouble, or you can help them avoid trouble. That’s building on the trust with the customer*” (Alpha).

To push services, it was deemed necessary to have a dedicated focus on sales activities. To do so required resources in terms of personnel; however, none was available at this stage. Consequently, the front-office was found to leverage product sales to support the growth of services in the early stages. For product sales, the selling of basic services was fairly straightforward, as they understood the need to provide them to support product functionality; however, the larger task was raising awareness of the cost of services and not providing them at no charge to secure product sales.

*Development stage:* In the subsequent stage, the subsidiaries began to gradually build on the basic service offerings by focusing on the development of intermediate and advanced services. This entailed developing a back-office capability that could provide *technical service support* at these subsidiaries. Technical service support included service-savvy support personnel that specialized in services based on the type of product offering. They possessed product-service know-how and served as internal consultants for any inquiry from the frontline service operations. One respondent explained the motivation for the formation of technical service support activities as follows: “*[before] we were actually ‘solo’ sales guys on our own, we always tried to find some people in the back office to help us find arguments*” (Beta). As a result, the front-office capability was able to draw from the back-office, while the back-office provided input based on mapping service processes and developing new technologies for service efficiencies.

The marked difference at this stage pertained to an open acknowledgement of the importance of developing *dedicated service sales* as part of a front-office capability. In doing so, the dependence on product sales to push services was less of an issue. In establishing their own service sales activities, these subsidiaries were able to charge for basic services that were previously given by product sales staff free of charge on a regular basis as part of product sales. Moreover, dedicated service salespersons were far more effective in selling intermediate and advanced services. One respondent aptly contrasted the difference in the approach as follows: “*I feel that there are differences. In the equipment division, I’d say they’re a little bit like hunters. They go in and they make a kill, and then they’re off for the next one [sale]. It tends to be a very quick process.*” Service salespersons were described as follows: “*I call them farmers because they have to work at the relationship over a number of weeks and months and years*” (Service Business Line Manager, Alpha). This illustrates the need to cultivate a relationship with the customer over an extended period of time. Although product salespersons had proven useful in selling basic services at the founding stage, they proved less competent in relation to intermediate and advanced services. These services required specialized training for communicating and selling customer-centric solutions. This also meant that frontline service technicians could focus on their core job of service operations (e.g., installations, repairs, monitoring, and upgrades) rather than expecting them to fulfil the dual role of being technicians and service salespersons concurrently. At this point, they were able to pass potential leads to service sales.

In addition, the front-office service capability began to focus on *service customization* for intermediate and advanced services to meet customer needs. This was done in liaison with technical service support in the back-office capability. Technical service support was able to aid frontline service personnel with the customization of specific offerings by providing technical know-how and feasibility studies for potential intermediate and advanced services for specific customers. One senior executive elaborated on the role of service customization activities as providing guidelines and processes for being able to localize: “...[we] *rolled it out to the sales people ... offering more optimizing services, getting more out of the existing installations by offering improvement services, optimizing services, and also connectivity was one of the milestones* (Beta). Consequently, the close interaction between technical support in the back-office and frontline service personnel was critical for service customization.

*Maturity stage:* At this stage, the subsidiaries were found to be highly focused on efforts toward *standardization of offering, process, and performance*. The front-office capability with dedicated sales and frontline service personnel was able to customize offerings for the customer base; however, it was the need to standardize the different service offerings and related processes (mainly related to the use of ICT systems) of delivering them in the back-office capability that seemed to take precedence at this stage. This was coupled with the need for a consistent means of monitoring and measuring performance to improve service efficiency.

*Offering standardization* at the subsidiaries was found to be an important step in reaching the mature stage. Although the subsidiaries had developed highly flexible and customizable intermediate and advanced services during the development stage, it became apparent that there was a need to control the degree of customization and to seek economies from repeatability. For instance, Iota recognized that too much customization was affecting the operational efficiency because it was difficult to measure, plan, and control labor costs, etc. As a result, the standardization of the offering was an important first step in the maturity stage. For instance, one executive explained, “*we found the problem already with, for example 10 salesmen, as they were selling 10 different plans. It’s difficult for one planner to understand 10 plans. Even for one customer, if they have 10 compressors, they have 10 plans*” (Beta). Thus, while the initial flexibility and customization of intermediate and advanced services were associated with high customer acquisition, it affected operational efficiency in the long-run.

*Process standardization* contributed to efficiency gains through a better utilization of frontline service personnel as well as the digitalization of the administrative aspects of the work. For example, Beta invested significant amounts of time in the standardization of the processes accompanied by the implementation of the enterprise resource planning (ERP) system which tracked these processes digitally. With the standardization and digitalization of processes, all service requests were recorded in the database, and it was simpler to generate key performance indicator (KPI)-based reports, to connect customers to service jobs, to monitor progress, etc. Kappa opted for an in-house development of systems that tracked all service operations and achieved similar results. Thus, good workflow between different activities (e.g., frontline operations and service sales) had the largest effect on operational efficiency. Moreover, efficiency was also achieved by end-to-end process integration between the front- and back-office capabilities. It was also noted that subsidiaries that standardized service processes before implementing the ICT systems performed better.

*Performance standardization* was reflected at the subsidiaries by tracking performance at a more granular level and by setting clear targets. Awareness of the operational performance allowed for more efficient as well as better customer-orientation. For instance, the Iota subsidiary reported implementing KPIs focusing on sales volumes (units sold), service delivery, customer satisfaction, and service efficiency. Similarly, Zeta set KPIs for all service offer types and monitored them on a monthly, quarterly, and yearly basis. One executive explained the reasoning behind this as follows: “*it was really hard to know how many service requests we received, how many service jobs are pending, and how long it takes to fix the customer’s problem. [In the past] it was an issue*” (Alpha). Another senior manager explained, “*I would say probably the transparency and the intelligence to analyze your utilization and efficiency, they were not considered during those early days. They are considered today*” (Iota). These subsidiaries then established clear routines and activities for service performance measurements that can be described as being mature with ongoing interactions between the front- and back-office capabilities.

Moreover, the subsidiaries on this path sought new ways to achieve efficiencies to improve the front- and back-office capabilities. This mostly entailed minor modifications to enhance the capabilities. Specifically, the

interactions between the front- and back-office were further solidified with the exchange of information and knowledge. As a result, the subsidiaries were able to achieve further operational efficiencies in delivering services on an ongoing basis. Hence, for this path, the next capability development stage is best described as one of seeking capability renewal.

### 4.3 Path II: Difficulties of capability replication

*Founding stage:* For the second identified path, the subsidiaries (Gamma and Epsilon) followed a highly similar approach to that discussed for the first path at the founding stage. This entailed a focus largely on creating service presence in the market by selling basic services with the help of *frontline service technicians*. Interestingly, one of the subsidiaries was also found to have a strong indirect approach to the market that was heavily dependent on the use of distributors. One executive explained: “*from country to country, it depends very much on the way we approach the market in the equipment sales because we have direct and indirect business*” (Gamma) and that this led to the issue of product salespersons selling through distributors, which had a detrimental effect on service: “*then we have a problem that the service people say, ‘Hey, why didn’t you sell it directly?’ Then, we could have done the service ourselves because we also always need work for our technicians*” (Gamma).

In Epsilon, there had been a concerted effort for product salespersons to sell services. One manager commented on this action as follows: “*...it started to become obvious when they were giving away services for free, and then they stopped doing it because they were paid less if they would do it for free as opposed to doing it for [sic] charging*” (Epsilon). By penalizing product sales from giving services away for free, it was hoped they would begin to understand the monetary value of the services. Hence, as for path one, the front-office capability founded frontline service support activities and leveraged on product sales to push services in the early phase.

*Development stage:* The two subsidiaries—Gamma and Epsilon—were found to have progressed to developing and attempting to deliver intermediate and advanced service offerings. The front-office capability at this stage had not established dedicated service sales functions to sell and liaise with customers; rather, it was still beholden to product sales. In addition, they had also sought to use frontline service personnel to sell services, as one General Manager explained: “*...operation manager was only is [sic] worried about [how] to manage the technicians, to do the repairs; and I began to use them to sell [services]*” (Epsilon). Coupled with this, the distributors were still being used in these markets. Hence, unlike the subsidiaries on path one, there still was no dedicated sales for service. This also led to ad-hoc service customization by frontline service personnel based on customer requests, leading to inefficiencies in the flow of information and a poor coordination of service activities.

For the back-office capability, both Gamma and Epsilon had developed technical service support activities, but they mostly operated on a reactive basis and were not staffed to an adequate level to support the front-office. One respondent commented: “*Somebody said you need to put people responsible for technical support. I put one person*” (Epsilon). Consequently, technical service support was found to not be fully developed and to be heavily under-resourced in terms of personnel.

*Maturity stage:* The front-office capability for the second identified path arguably had reached a certain level of maturity, though not to the same extent as identified for subsidiaries on path one. Gamma and Epsilon both were able to deliver a range of service offerings, varying in complexity with the frontline service personnel, coupled with the ability to customize and to adapt service to meet specific needs in most instances; however, the challenge remained one of not standardizing in the back-office in terms of the service offerings, processes, and performance metrics. Thus, although technical service support was available, the back-office had not reached a level of maturity as seen for path one. Moreover, the interactions between the front- and back-office capabilities were found to have not developed fully. Concomitantly, the challenge was one of not being able to leverage learning from one customer to the next and to benefit through improved efficiencies over time; rather, the two subsidiaries lacked clear operational control of service production.

The two subsidiaries on this path were found to struggle to reproduce the way the subsidiaries on path one had been able to progress in capability development across the stages. The challenge here was one of not being able to fully replicate the capabilities across the customer base. This can be explained as an outcome of the inability

to standardize the offerings, processes, and performance in the back-office, leading to the lack of repeatability across customers.

#### 4.4 Path III: Capability retrenchment and service dilution

*Founding stage:* The third identified path presented a highly different scenario in comparison with the other two paths described. Here, the subsidiaries—Delta, Eta and Theta— were attempting to simultaneously provide the whole spectrum of services from basic to advanced services. This entailed significant upfront investments and the simultaneous development of both front- and back-office capabilities. In terms of back-office capabilities, these subsidiaries began with *technical service support* to assist frontline service personnel. For the front-office capability, these subsidiaries—like those on the other identified paths—founded *frontline service operations* to build a service presence and to deliver customer support; however, the numbers in terms of service personnel were markedly lower than the other subsidiaries. Interestingly, unlike the subsidiaries on the other paths, Delta, Eta, and Theta had all simultaneously founded *service sales* and had begun *service customization*, which were supported by technical service support as part of the back-office capability, but the feedback from the frontline personnel to back-office support was done on an ad-hoc basis, potentially due to the low number of personnel on the frontline.

*Development stage:* As these subsidiaries progressed to this stage, they were confronted with a demand for services that they were unable to fully meet, leading to lower customer satisfaction and decreasing performance levels. Although these subsidiaries were able to standardize the offerings to an extent, they lacked standardization in terms of processes that would support the front-office in their activities. Whereas on the two other paths, the subsidiaries were able to build on initial investments, Delta, Eta, and Theta were unable to scale their activities and to reap the benefits. Although these subsidiaries were providing a standardized service offering developed in the back-office, the failure to develop modular processes for service delivery resulted in the inability to replicate them across the customer base, leading to low service efficiency and profits. Coupled with this, limited interactions between front- and back-office capabilities rendered tensions that became a perennial challenge that required management attention. In addition, the lack of interaction with the back-office activities led to an inadequate exchange of information and development of clear performance metrics to support the subsidiaries.

*Maturity stage:* Ultimately, these three subsidiaries—Delta, Eta, and Theta—opted to move to providing basic and some intermediary level services only. In doing so, they maintained the frontline service personnel, albeit in lower numbers, and reduced the service sales team. In the back-office, technical service continued to provide support to the front-office. In addition, these subsidiaries undertook standardization of the offerings, but this was limited to simpler (or basic) services. They were able to devise performance metrics in terms of service sales and efficiency for the basic services. As one manager explained: “*we have the KPI for the sales revenue, and the KPI for the efficiency ... and that’s to make us focus on our business*” (Theta).

For path three, the subsidiaries had reached a level of maturity but only for the basic services; hence, as they attempted to start at the outset by trying to deliver the whole spectrum of services and to devise the necessary front- and back-office capabilities, they experienced many difficulties and challenges in making them economically viable (cf. Kowalkowski et al., 2017). In the end, attempting to move too fast with standardization capability development resulted in the eventual retrenchment in the level of capability, whereby these subsidiaries curtailed their service offerings to delivering only basic and intermediary level services.

Figure 2 provides a representation depicting the three paths identified during this study, detailing the types of services provided at the different development stages and the front- and back-office capabilities as well as the levels of interaction.

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INSERT FIGURE 2 ABOUT HERE

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## 5 Discussion

This study builds on the servitization capabilities literature (Kindstrom et al., 2013; Rönnerberg et al., 2016; Valtakoski & Witell, 2018) by examining the internal service ecosystem within a large complex manufacturer by studying ten of its subsidiaries. In particular, attention focused on front- and back-office capability development and interactions using Helfat and Peteraf's (2003) capability lifecycle stages. In doing so, three discernible paths to capability development unfolding across the subsidiaries were identified, with each path raising important implications and challenges for the further development of capabilities.

### 5.1. Theoretical implications

This study makes three notable contributions. The first contribution pertains to understanding the path to capability development and the challenges encountered. The findings show the sequential development of capabilities to be the most conducive, beginning with front-office capability (cf. Sawhney, 2006; Davies et al., 2006). The standardization of capabilities is required in the back-office; however, it was not found that this precedes the development of customer-facing capabilities, as suggested by some authors (Kowalkowski et al., 2015; Oliva & Kallenberg, 2003). The findings do indicate that standardization is vitally important (Davies et al., 2006; Kowalkowski et al., 2015; Raja et al., 2017), but this occurs as the capability begins to reach the maturity stage. The first identified path shows the importance of interactions between the front- and back-office for capability development, especially during the development and maturity stages. In contrast, the second identified path illustrates that when there is only limited interaction on an ad-hoc basis, capability development is likely to be hindered in reaching maturity. This would suggest the need for clear routines for exchange between the front- and back-office capabilities. Furthermore, the study indicated the importance of having clear front-office routines for feedback to the back-office. In doing so, the back-office can then support the standardization of the offering, process, and performance. The lack of standardization was found to be a major obstacle to fully developing intermediate and advanced services. Where full capability development was observed, as for path one, the ability to progress further with capability renewal through the introduction of modifications of the capability to enhance it further was also noted (cf. Helfat and Peteraf, 2003).

The second contribution is to highlight the lack of capability replication across the entire internal service ecosystem. Winter and Szulanski (2001) note the importance of a replication strategy for reproducing a capability in different geographical markets. In this study, it was found that the subsidiaries identified for path one were able to replicate routines and activities across one another; however, this was not the case for paths two and three. Rather, it was found that opportunities for sharing knowledge about service customization in the front-office and the standardization of offerings, processes, and performance standards were not leveraged throughout the internal ecosystem, which would explain the challenge of being able to benefit from making service and solutions repeatable for different markets (cf. Davies & Brady, 2000; Davies et al., 2006).

The third contribution highlights the difficulties of simultaneously attempting to develop front- and back-office capabilities while attempting to deliver the full spectrum of services within the firm portfolio. For path one, the subsidiaries identified began with providing basic services to support the product portfolio, followed by the development of routines and activities to offer intermediate and advanced services with technical service support in the back-office, eventually leading to the need to standardize as the capability matured to realize efficiencies. In stark contrast, the subsidiaries identified for path three attempted to take on more than they could handle at the outset by providing the full range of services without the necessary resources and support to deliver them. Consequently, these subsidiaries fell short in terms of meeting customer needs and the necessary performance standards. Interestingly, it should be noted that rather than continuing to develop and to pursue intermediate and advanced services, these subsidiaries opted to revert to providing basic and some intermediate level services to support their products, hence the retrenchment in the level of capability and service dilution (cf. Kowalkowski et al. 2017). This study therefore suggests that the inability to develop the requisite capabilities for advanced offerings potentially explains the reason for moving away from providing the full spectrum of services, at least in part.

### 5.2. Managerial implications

This study raises important managerial implications. First, firms embarking on a journey towards servitization must consider how they develop the necessary capabilities. To do so, the study indicated that a sequential approach is potentially best suited for large global manufacturers. At the founding stage, a front-office capability comprised of frontline service personnel is essential to understanding customer needs and developing trust. This would echo the suggestion by Baik et al. (2019) that improving the service-provision capabilities of employees is critical and that HR practices have an important role for servitizing firms (Raja et al., 2010; Johnstone et al., 2014). Following this, managers must provide the necessary back-office technical support for the front-office personnel delivering and customizing services. Moreover, once the routines and activities are in place across both the front- and back-office with clear lines of interaction, the back-office must support the business by standardizing the service offerings, processes, and performance metrics. In doing so, it will be more likely that the benefits from repeatability can be obtained.

Second, in this study, it was found that Servino did not adequately leverage learning across the internal service ecosystem. This raises an important point regarding the role of having a “strong center,” as advocated by researchers (Davies et al., 2006; Sawhney, 2006). Large organizations such as Servino would undoubtedly benefit from the center orchestrating the sharing of practices across the subsidiaries in the ecosystem (cf. Hullova et al., 2019). Only in half of the subsidiaries in the internal ecosystem studied was clear evidence of interconnections found. The center then is in an ideal position to take on the task of replicating the service capability to subsidiaries in different geographical markets.

Lastly, managers are cautioned against attempting to simultaneously deliver the full range of services at the founding stage. The findings suggest that the subsidiaries that attempted to do so struggled to accumulate learning in attempting to develop the necessary capabilities. That said, with the support of a strong center, by leveraging expertise and know-how from other parts of the internal ecosystem, there is the possibility that a speedier approach to service capability development is feasible. Furthermore, the findings from this study suggest that it is not only the standardization of the offerings that is required but also the standardization of processes and performance metrics. Managers must ensure that the interaction between the front- and back-office is facilitated to avoid tensions festering, especially to avoid low service efficiency and potential financial losses.

### **5.3. Limitations and further research**

This study is not without limitations. The internal service ecosystem of one large complex manufacturer was examined. Further studies should broaden this focus and examine the entire ecosystem to explore how this may impact the service capability development process. It would be especially worthwhile to examine the interdependencies and complementarities of the ecosystem (Adner & Kapoor, 2010). It would be pertinent to study the role of different actors in delivering different levels of services. For example, it is known that the role of distributors and local intermediaries in delivering advanced services is critical (Reim et al., 2019; Story et al., 2017), whereas some argue the development of advanced services should be done internally (Bustinza et al., 2019). Thus, researching the co-development of capabilities with external partners would be a fruitful line of inquiry to pursue. In addition, studies have begun to identify digitization capabilities within a servitized context (Cenamor, Rönnerberg Sjödin, & Parida, 2017; Coreynen, Matthyssens, & Van Bockhaven, 2017; Lenka, Parida, & Wincent, 2017), which is an area ripe for further investigation regarding how they develop and interact with other capabilities. Lastly, as is always the case with qualitative case study research, there is the issue of the broader generalizability of the findings from this study; however, the paths identified may be analytically generalizable to other contexts for other researchers to explore further.

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**Table 1:** Key indicative studies identifying capabilities for servitization

Indicative studies	Method	Number of identified capabilities	Description of identified capabilities
Davies (2004)	In-depth interviews with up to ten senior managers and directors in each of the five case studies	4 integrated solution capabilities	Capabilities include: system integration, operational services, business consultancy, and finance.
Davies, Brady, and Hobday (2006)	In-depth collaboration with 5 case companies, 100 CEOs, directors, senior project managers, heads of functional department, and project managers	4 strategic capabilities	Capabilities include: system integration, operational services, business consultancy, and vendor financing.
Fischer, Gebauer, Gregory, Ren, and Fleisch (2010)	Multiple-case study with 13 companies	3 dynamic capabilities micro-foundations for exploring and exploiting service opportunities	<i>Exploration of service opportunities:</i> integrating the basic services into the product price; creating a new value constellation; and making use of the service expansion along the adjacent customer activity chain. <i>Exploitation of service opportunities:</i> integrating the basic services into the product price; separating product and service business to extend service profit and revenue; and making use of the service expansion along the primary customer activity chain.
Gebauer, Fleisch, and Friedli (2005)	30 equipment manufacturing companies	5 service capabilities	Capabilities include: establishing a market-oriented and clearly defined service development process, focusing service offers on the value proposition to the customer, initiating relationship marketing, defining a clear service strategy, establishing a separate service organization, and creating a service culture.
Gebauer (2011)	Eight qualitative case studies of capital goods manufacturing companies based on 32 interviews	Dynamic and operational capabilities for transitioning from product to service	Identified innovation management as a novel dynamic capability that allows for reconfiguring operational capabilities for service. Operational service capabilities include: innovating, selling, and delivery.
Gebauer, Saul, Haldimann, and Gustafsson (2017)	22 interviews with 8 companies	3 organizational capabilities	Organizational capabilities include: financing such services, aligning costs with equipment usage, and collaborating with customer.
Huikkola and Kohtamäki (2017)	Interviews with 35 executives from nine leading industrial solution providers, their strategic	7 strategic capabilities	Capabilities include: fleet management capability, technology-development capability, mergers and acquisitions capability, value quantifying capability, project management capability, supplier network management capability, and value co-creation capability.

	customers and suppliers.		
Kindström and Kowalkowski (2014)	Over 100 in-depth interviews, and more than 20 workshops and focus group meetings	25 capabilities for service innovation grouped in 8 business model elements	<p><i>Offering:</i> Offering portfolio management capability, product-service integration capability, design-to-service capability, and customer needing interpretation capability.</p> <p><i>Revenue model:</i> Pricing capability, value visualization capability, risk assessment, and mitigation capability.</p> <p><i>Development process:</i> User involvement and engagement capability, internal sensing capability, formalization, and replication capability.</p> <p><i>Sales process:</i> Value visualization capability, internal coordination capability, and customer needing interpretation capability.</p> <p><i>Delivery process:</i> Capacity utilization and prognostication capability and internal-external design capability.</p> <p><i>Customer relationship:</i> Customer embeddedness capability, proactive-reactive balancing capability, and customer portfolio management capability.</p> <p><i>Value network:</i> orchestration capability, partner knowledge capability, and network dynamics understanding capability.</p> <p><i>Culture:</i> Service leadership capability, service logic translation capability, and product-service balancing capability.</p>
Kindström, Kowalkowski, and Sandberg (2013)	Eight qualitative case studies	3 dynamic capability micro-foundations and 10 service-innovation-oriented micro-foundations	<p><i>Sensing, new approaches to opportunity discovery:</i> customer-linked service sensing, service system sensing, internal service sensing, and technology exploration.</p> <p><i>Seizing: capitalizing on service innovation opportunities:</i> service interactions, managing the service delivery process, structuring the service development process, and adopting new revenue mechanisms.</p> <p><i>Reconfiguring, shifting the competitive arena:</i> orchestrating the service system, balancing product- and service-innovation related assets, and creating a service-oriented mental model.</p>
Lenka, Parida, and Wincent (2017)	4 case studies with 28 interviews	3 digitalization capability	These include: intelligence capability, connect capability, and analytic capability.
Neu and Brown (2005)	Pre-study: 16 in-depth interviews in 3 companies. Main study: 75 interviews with 25 managers in 3 companies.	4 group capabilities and 11 subgroup capabilities	<p><i>Human resources:</i> adapting frontline roles to cope with the complex market, hiring for behavioral competencies, technical expertise, and attitude, developing technical expertise, and retaining the competencies needed to cope with market complexity.</p> <p><i>Structure:</i> integrating business unit responsibilities, intrafirm collaborations, and interfirm collaboration and decentralization.</p> <p><i>Measurement and rewards:</i> adapting the managerial financial incentive system.</p> <p><i>Processes of strategy formulation:</i> processing information while formulating strategy and staging an improvisational performance while implementing strategy.</p>
Paiola, Saccani, Perona, and Gebauer (2013)	20 exploratory, 4 in-depth case studies, 23 executive interviews	4 types of capabilities	Capabilities include: selling after-sales services, integrating after-sales solutions, selling life-cycle solutions, and orchestrating total solutions.

Parida, Sjödin, Lenka, and Wincent (2015)	Multi case study of 13 multinational manufacturing companies	4 global service innovation capabilities	These include: develop global customer insights, integrate global knowledge, create global services offerings, and build a global digitalization capability.
Parida, Sjödin, Wincent, and Kohtamäki (2014)	Survey of 122 Finnish manufacturing companies, case studies in 11 Swedish and Finnish manufacturing companies	4 capabilities and 15 capability dimensions	Capabilities include: business model design, network management, integrated development, and service delivery network development.
Raddats, Zolkiewski, Story, Burton, Baines, and Ziaee Bigdeli (2017)	Exploratory study consisting of 7 dyadic relationships in 5 sectors.	4 capabilities built through interaction	Capabilities include: knowledge development, service enablement, service development, and risk management.
Sjödin, Parida, and Kohtamäki (2016)	fsQCA on a survey data set of 131 Swedish manufacturing firms	Service development capabilities and mass service customization capabilities	The configurations incorporate either high levels of mass service customization capabilities or service development capabilities. Findings show that firms either focus on more standardized service development at back-end units (e.g., research & development) or building capabilities for mass service customization in the front-end market facing units.
Storbacka (2011)	10 multinational firms, 5 expert interviews, 10 executive interviews, workshops	12 capability categories and 64 capabilities and management practices	Capability categories: value research, value proposition, value quantification, value verification, solution development, solution availability, solution configuration, solution delivery, strategy planning, management system, infrastructure support, and human research management.
Story, Raddats, Burton, Zolkiewski, and Baines (2017)	Interviews were conducted with 24 senior executives in 9 UK-based manufacturers, intermediaries, and customers across multiple sectors	Multi-actor approach explored capabilities themes: 7 manufacturer-specific capabilities, 2 intermediary-specific capabilities, and 2 customer-specific capabilities	<i>Manufacturer-specific:</i> service innovation, influence of product expertise, services methodologies and processes for developing efficiency gains, risk management, mitigation and pricing and delivery of risk/reward contracts, understanding customers' needs, developing and retaining frontline service personnel with technical expertise, and service culture. <i>Intermediary-specific capabilities:</i> product availability, advice, and purchasing for customers and local service infrastructure. <i>Customer-specific capabilities:</i> adoption of technology and degree of willingness to outsource practical activities.
Uлага and Reinartz (2011)	22 manufacturing companies	5 distinctive capabilities	Distinctive capabilities include: service-related data processing and interpretation capability, execution risk assessment and mitigation capability, design-to-service capability, hybrid offering sales capability, and hybrid offering deployment capability.

Valtakoski and Witell (2018)	Survey and externally sourced financial data on 224 SMEs in the software industry	Front-office service capabilities and back-office service capabilities	FO service capability are the collection of organizational routines that directly influence the firm across the firm-customer interface, such as service customization and adaptation. BO service capability are the collection of organizational routines related to BO service activities, including the management of service demand and capacity, service operations, and human resources management.
Wallin, Parida, and Isaksson (2015)	In-depth case study with 40 in-depth explorative and semi-structured interviews	7 capabilities across 3 phases	<i>Need phase:</i> Continuous customer interaction, establishing innovative PSS climate. <i>Solution-seeking phase:</i> Promoting cross-functionality, involvement of network partners. <i>Solution development phase:</i> Building PSS competence, establishing PSS business case.



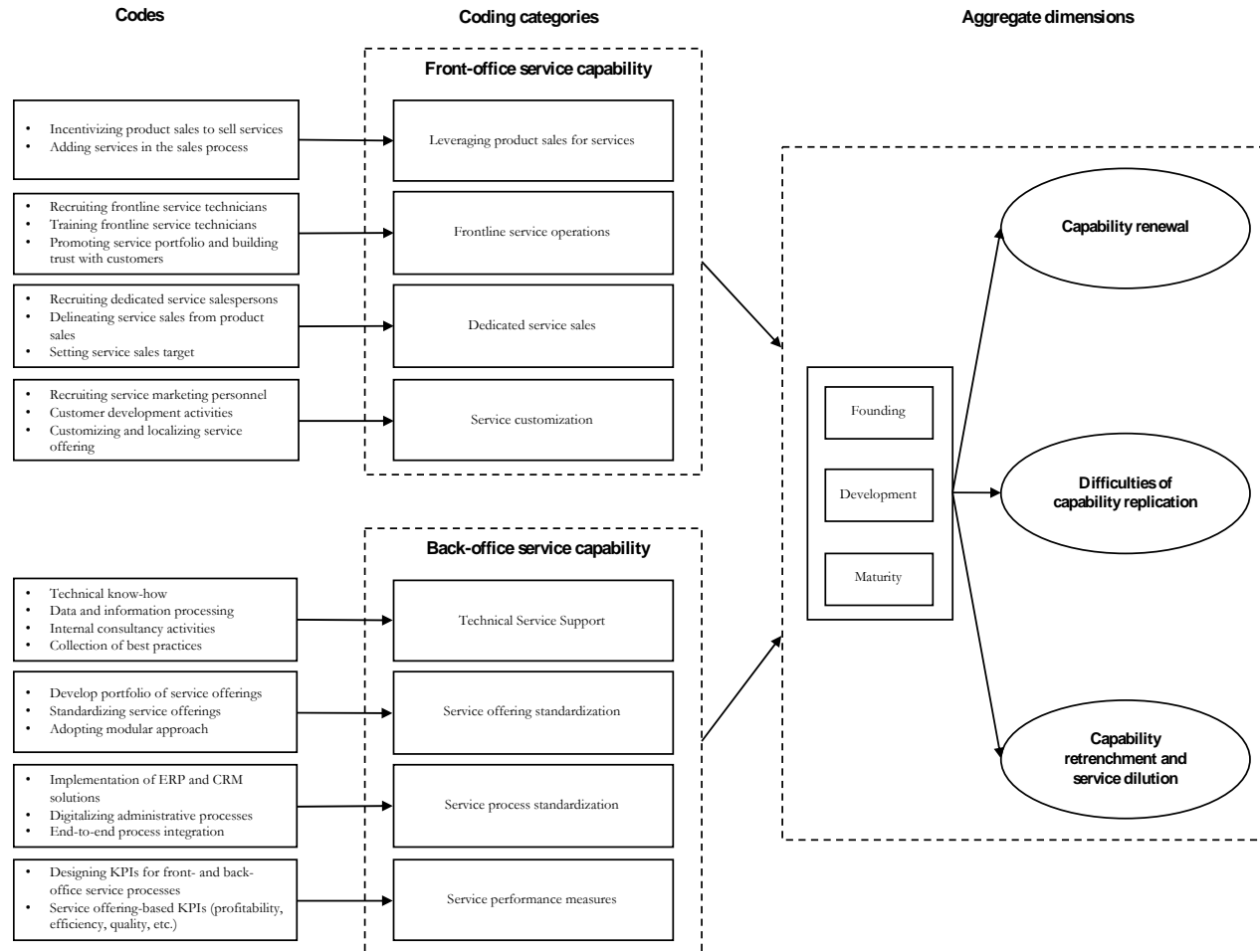
**Table 2:** Key indicative studies on front- and back-end

Key indicative sources	Key findings
Foote, Galbraith, Hope, and Miller (2001)	Study proposes need for uncomfortable change by: (1) Forming strong front-end solutions units with profit-and-loss responsibility (2) Refocusing the back end (3) Developing strong center
Oliva and Kallenberg (2003)	Study proposes the following approach: (1) Consolidate the product-related service offering; (2) Enter the installed base service market; (3a) Expand to relationship-based services; (3b) Expand to process-centered services; and (4) Take over the end-user's operations
Sawhney (2006)	Study proposes solution capability development in a phased manner in four stages: (1) Initial front-end moves; (2) Expand the front-end; (3) Build the back-end; and (4) Re-focus the entire organization
Davies, Brady, and Hobday (2006)	To deliver integrated solutions, the study proposes: (1) The company must build a new face for the customer; (2) It needs to strengthen its back-end capabilities; and (3) The organization — front and back — must be refocused around customers' needs and around repeatable, integrated solutions delivery
Reinartz and Ulaga (2008)	The study proposes the following approach: (1) A list of services currently provided to customers; Revenues from easily chargeable services; A senior executive who oversees the development of service capabilities (2) Industrialize the back office: Standardize service processes and control mechanisms; service platforms flexible enough to fit individual customer contexts (3) Service-selling know-how or separate sales force; incentive system that promotes service sales; tools for documenting value and communicating it to customers (4) Detailed descriptions of core customer concerns and operating processes; a shift from activity based to outcome-oriented performance indicators; a checklist of capabilities needed to compete in new services spaces
Sjödén Rönnberg, Parida, and Kohtamäki (2016)	The study suggests that “firms may follow two different paths towards advanced services offerings, focusing on more standardized service development at back-end units (e.g. research & development), or building capabilities for mass service customization in the front-end market facing units” (p. 5334)
Valtakoski and Witell (2018)	The study showed that for small and medium enterprises (SMEs) industry, firm size, and age impact the servitization path. That the relative importance of front- and back-office capabilities changes over time, with younger SMEs benefitting from front-office capabilities at the outset but must be able to shift focus to the back-office as they mature for optimal outcomes

**Table 3:** Interviews conducted across subsidiaries

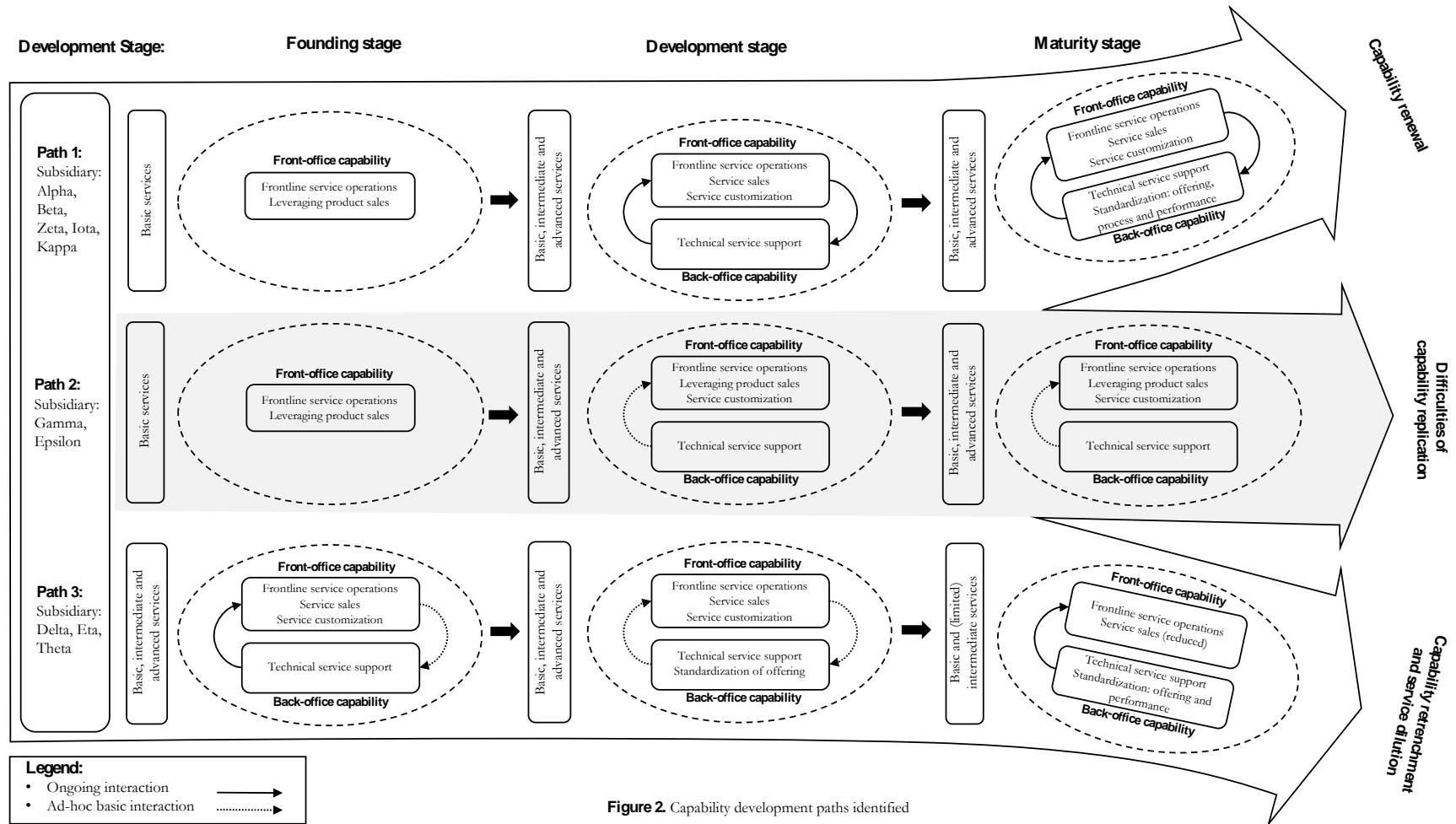
<b>Subsidiary</b>	<b>Management interviews</b>	<b>Operational interviews</b>	<b>Capability development path identified</b>
<b>Head Office</b>	2	0	N/A
<b>Alpha</b>	5	4	Path I
<b>Beta</b>	6	4	Path I
<b>Gamma</b>	4	5	Path II
<b>Delta</b>	6	4	Path III
<b>Epsilon</b>	5	3	Path II
<b>Zeta</b>	4	5	Path I
<b>Eta</b>	3	5	Path III
<b>Theta</b>	5	5	Path III
<b>Iota</b>	5	4	Path I
<b>Kappa</b>	4	5	Path I
<b><i>Total interviews:</i></b>	<b>49</b>	<b>44</b>	

**Figure 1**



**Figure 1. Data structure**

**Figure 2**



**Figure 2.** Capability development paths identified