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## Overcoming the challenges of smart solution development: Co-alignment of processes, routines, and practices to manage product, service, and software integration

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### ABSTRACT

The present study scrutinizes how an incumbent solution provider executes smart solution development (SSD). We aim to contribute to digital servitization research, which primarily focuses on either product, service, or software development, thus overlooking the integrative aspect of SSD. We unfold the holistic SSD development process in a single case study through 23 manager interviews, observational data, and strategic document analysis. The study extends the product-service innovations (PSI) literature by 1) identifying a set of innovation routines, such as collaborative, customer-focused, and decision-making, 2) demonstrating innovation management processes and practices associated with those routines, and 3) highlighting the co-alignment of innovation processes, routines, and practices to achieve improved outcomes from SSD. The study translates the empirical work into a framework and a set of propositions to guide future research. For managers, the study provides a framework and a set of capability-enhancing practices for a benchmark.

### 1. Introduction

In the search for competitive advantage, manufacturers have moved from offering products to offering advanced product-service-software systems, a transition coined as digital servitization (Hsuan et al., 2021; Jovanovic et al., 2021; Kohtamäki et al., 2019). Indeed, ever-changing customer requirements, financial turmoil, intensified competition, product commoditization, and advancements in cyber-technical systems and digital technologies have ensured that manufacturers cannot rely solely on innovating breakthrough products. Consequently, they need to bundle products, services, and software into smart solutions to increase customer value and internal efficiency (Bustinza et al., 2018; Hsuan et al., 2021; Porter and Heppelmann, 2015). The term “smart” refers to the connectivity elements embedded in the solutions, enabled by ports, protocols, and Internet of Things (IoT)-type of technologies (Allmendinger and Lombreglia, 2005; Porter

and Heppelmann, 2015; Tian et al., 2021), whereas the term “solutions” refers to a bundle of products, services, and software (Shankar et al., 2009; Storbacka et al., 2013; Windahl and Lakemond, 2010). Development, sales, and deployment of such smart solutions require reconfiguration of organizational processes, structures, assets, and routines (Töytäri et al., 2018; Ulaga and Reinartz, 2011; Rabetino et al., 2018; Raddats et al., 2019; Vendrell-Herrero et al., 2020) while addressing underlying customer needs and productivity pressures (Cusumano et al., 2015; Rabetino et al., 2017; Reinartz and Ulaga, 2008; Visnjic et al., 2018). The present study focuses on the innovation processes, routines, and practices in developing smart solutions.

Despite the wealth of literature on product innovation (Danneels, 2002) and new service development processes (Gremyr et al., 2014; Kindström and Kowalkowski, 2009), software development (Gurbaxani, 2016) has been less studied, in particular, regarding how the development of smart solutions is organized and managed within

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manufacturers. This integration of products, services, and software can pose several challenges for manufacturers in practice, as product-driven culture, mindset, capabilities, and routines may hinder customer understanding (Bustinza et al., 2017; Kowalkowski and Ulaga, 2017). Additionally, manufacturers may face difficulties in terms of structural arrangements (e.g., silo effects, tensions, and clashes between products, services, and software) stemming from separately organized profit-and-loss units (Bond III et al., 2020; Neu and Brown, 2005) and dispersed development models (Kindström and Kowalkowski, 2009). Furthermore, allocating resources to product, service, and software development initiatives may cause difficulties for managers regarding their different development cycles and velocity of change in the business environment (Kowalkowski and Ulaga, 2017).

While operations and customer relationship management processes have been studied extensively in the extant servitization-based innovation research (Johansson et al., 2019; Panesar and Markeset, 2008; Schaarschmidt et al., 2018), innovation-related micro-level processes and routines in smart solution development (SSD) are frequently overlooked (see Rabetino et al., 2017). Only very few existing studies focus on delving into micro-level processes and routines that facilitate the emergence of (smart) solution innovations, despite few exceptions (e.g., Kindström et al., 2013; Panesar and Markeset, 2008; Sjödin et al., 2020). This lack of evidence limits our understanding of these micro-level integration challenges and how manufacturers can overcome them in the smart solution design phase (Ulaga and Reinartz, 2011). A call exists for studies that would convey a holistic understanding of the innovation processes, where specific practices are used to co-align the routines in such innovation processes as Schaarschmidt et al. (2018: 129) call for: *“For example, researchers could clarify the nature and dimensionality of a hybrid offerings alignment capability—that is, a firm’s capability to effectively align its goods and services innovation. This would overcome the limitation of the present study which focused on goods and service innovation parts of hybrid offerings, thus somewhat ignoring the alignment between both components.”*

This study aims to address the following research question: *How does a manufacturer manage its innovation process at the micro-level to facilitate smart solution development?* The study aims to extend the literature on digital servitization and solution innovations by employing action research to conduct an in-depth single-case study based on observations, in-depth interviews, and strategic document analysis. We examine one of the leading smart solution providers in the marine and energy industries, Wärtsilä, which provides an interesting case of an incumbent firm that has just redefined its innovation processes and routines to overcome the perceived issues misalignment and those related dysfunctions. The contributions to the digital servitization and new solution development literature are threefold, as this study 1) reveals an exciting set of innovation routines, which are categorized as collaborative, customer-focused, and decision-making routines, 2) demonstrates several innovation processes and practices associated with those routines, and 3) highlights the co-alignment of innovation processes, routines, and practices to drive SSD to achieve faster development cycles (shorter time-to-market), increased customer understanding (improved success of new solutions), and better intrafirm collaboration (fewer silo effects). The study provides a benchmark for how SSD is managed on the ground level within an incumbent manufacturer for managers responsible for developing smart solutions.

## 2. Theoretical development

### 2.1. Digital servitization

Recently, digital servitization has gained increasing academic attention (Coreynen et al., 2020; Hsuan et al., 2021; Kohtamäki et al., 2019; Paschou et al., 2020; Tian et al., 2021). It refers to a manufacturer’s transition from offering products to offering advanced product-service-software systems (Kowalkowski et al., 2017; Sklyar

et al., 2019). This transition can be seen as moving from a product logic to a service logic (Kowalkowski and Ulaga, 2017). Manufacturers servitize their business models to differentiate themselves (Baines et al., 2017), increase their revenues (Gebauer et al., 2011), generate higher profits (Gebauer and Fleisch, 2007), and improve their performance (Vendrell-Herrero et al., 2017) and market value (Fang et al., 2008). The software element has already been included in the original notion of servitization (Vandermerwe and Rada, 1988). However, extant research has not placed enough emphasis on digitalization (Coreynen et al., 2017; Kohtamäki et al., 2019), considering the potential provided by advanced digital tools and technologies that enable connectivity between systems such as the IoT, augmented reality (AR), and artificial intelligence (AI) (Langley et al., 2021; Porter & Heppelmann, 2014, 2017; Tian et al., 2021). The mismatch in clock speeds (velocity of change in the business environment; see Mendelson and Pillai, 1999) and capability requirements for product, service, and software innovations sets a challenge for any manufacturer to develop innovation processes and practices co-align the innovation routines for SSD.

Existing studies on digital servitization has identified new capability requirements that take place in ecosystem-level (Kohtamäki et al., 2019; Sklyar et al., 2019; Vendrell-Herrero et al., 2017), relational level (Töytäri et al., 2018), and focal company level (Lenka et al., 2018; Salonen and Jaakkola, 2015). Within focal companies, Töytäri et al. (2018) have found out that smart services require bridging both mindset and capability barriers. In practice, they need to obtain new (technical) capabilities and practices in data processing and solution design (Ardolino et al., 2017; Ulaga and Reinartz, 2011) to provide new types of smart solutions such as operations and maintenance (O&M) solutions (Huikkola et al., 2020), outcome-based contracts (OBCs); (see Korkeamäki and Kohtamäki, 2020), and performance-based agreements (Visnjic et al., 2018).

### 2.2. Smart solution development

Smart solutions consist of product features such as hardware and mechanical/physical parts, intelligent features such as software and sensors, connectivity features such as ports, protocols, and networks (Porter and Heppelmann, 2015), data features such as historical data collected from the equipment usage (Allmendinger and Lombreglia, 2005; Langley et al., 2021), and service features such as field employees’ knowhow (Ulaga and Reinartz, 2011). Typically, smart solutions are reminiscent of embedded systems, indicating that manufacturers can benefit from new solution offerings or more efficient business operations. However, there is also an option that software offerings are separately developed, sold, and deployed (e.g., the IBM approach during its strategic transformation).

The development of smart solutions has been conceptualized in a way that manufacturers must cope with paradoxical tensions between product, service, and software innovations and co-align their contradictory capabilities, processes, and identities (Huikkola et al., 2021; Kohtamäki et al., 2020a). For instance, in product innovations, efficiency logic dominates, and the key target is to build a scalable business, extend the product lifecycle, and generate productivity benefits emerging from standardization (Hsuan et al., 2021; Ulaga and Reinartz, 2011). In contrast, in service innovations, the key target is to lock in the customer and lock-out the competitors through improved customer engagement (Luoto et al., 2017; Tuli et al., 2017), whereas in software-based innovations, logic emphasizes decentralized decision-making and agile development such as fast validation and iterative processes (Immelt, 2017; Rigby et al., 2016). However, combining product, service, and software innovations may be challenging since new product development (NPD) processes typically dominate in manufacturing companies (see Santamaría et al., 2012) even though some incumbent firms have established separate development models for service and software innovations (Gremyr et al., 2014; Kindström and Kowalkowski, 2009; Kowalkowski and Ulaga, 2017).

Thus, the integration of all three may prove troublesome.

The existing literature on solution business has found that to increase shareholder value, service/solution sales should account for 20–30% of a manufacturer's sales (Fang et al., 2008). Other empirical studies on the performance effects of product-service innovation (PSI) (e.g., Suarez et al., 2013; Vendrell-Herrero et al., 2020; Visnjic et al., 2013) have demonstrated that adverse or stagnant performance results stem from higher development costs regarding the adoption of new innovative product-service processes (Bustinza et al., 2017). When considering internal rigidities caused by the separate profit-and-loss units (Gebauer et al., 2010), distinct cultures (Kohtamäki et al., 2020a; Kowalkowski and Ulaga, 2017), and capability mismatch (Töytäri et al., 2018), it is likely that the manufacturer's transaction-costs (e.g., coordination and governance costs) initially increase (Kohtamäki et al., 2020b). Extant studies have suggested that manufacturers need better alignment between different units (Schaarschmidt et al., 2018) and systematic capability development (Huikkola et al., 2020) when pursuing strategies regarding smart solutions.

A challenge highlighted in the existing studies on customer solutions (Tuli et al., 2007) is that their benefits are difficult to analyze and measure. Today, sales of the most advanced solutions (e.g., operations and maintenance services, process optimization solutions, and OBCs) are minimal for many established manufacturers. Even though smart solutions provide opportunities to differentiate and lock in customers (Bustinza et al., 2017; Schaarschmidt et al., 2021) and have been identified as a strategic development area for many manufacturers (e.g., GE, AGCO, and Rolls-Royce), there are not yet many incentives for their larger-scale development. Sales of such solutions also cause internal conflicts within the firms, such as dividing sales and profits between capital expenditure (CAPEX) and operational expenditure (OPEX) businesses. For many established manufacturers, spare parts and new equipment sales account for a remarkable share of their current profits (Huikkola et al., 2020). For instance, even though elevator manufacturer KONE has servitized a long time ago (systematic service sales started already in the 1920s), most of its profits are derived from new equipment sales (author's elaboration based on the firm's public documents during the last 15 years) and spare parts account for the majority of their services sales. Thus, when developing innovative smart solutions, managers ought to consider the timespan limitations and short-sightedness (Töytäri et al., 2018) as well as potential internal rigidities during design, sales, and deployment phases.

### 2.3. Processes, routines, and practices for smart solution development

Bundling products, services, and software poses both strategic and operational challenges for incumbent manufacturers (Porter and Heppelmann, 2014). This integration calls for new capabilities (e.g., design-to-service capabilities; see Ulaga and Reinartz, 2011), development processes and models (Panesar and Markeset, 2008), routines (Panesar and Markeset, 2008; Kowalkowski and Ulaga, 2017), and practices (Sjödin et al., 2020) from manufacturing companies.

The extant new service development (NSD) literature has identified general processes and stage models for new service innovations (Gremyr et al., 2014; Kindström and Kowalkowski, 2009; Panesar and Markeset, 2008; Rapaccini et al., 2013). In the extant NSD literature, these processes and stages are typically divided into a) innovation and idea, b) concept planning, c) development, d) launch, and e) implementation/delivery phases. While the development stages may be the same in both products and services, resources are allocated differently between them (Kowalkowski and Ulaga, 2017) as NPD requires more resources in the early phases and service development calls for more resources in the later phases (see Kowalkowski and Kindström, 2012).

Organizational routines are described as regular, repetitive, and predictable behavioral and activity patterns to accomplish specific organizational tasks to develop capabilities (Becker et al., 2005; Feldman et al., 2016). The organizational routines literature suggests that

firms learn from process experience and previous (similar) situations and “trial-and-error” (Bingham and Eisenhardt, 2011; Schilke et al., 2018). Routines thus consist of specific, repeated action steps and checklists used to progress in a process (Bingham and Eisenhardt, 2011). The opposite of routines is ad hoc behavior and problem-solving (Heimeriks et al., 2012; Helfat and Winter 2011). Routines are reminiscent of the operational way to “get things done” even at a single-task level (e.g., how to develop solutions in practice; Schilke et al., 2018).

The extant innovation literature (e.g., Bessant et al., 2001; Jones and Craven, 2001) has studied how incumbent firms develop new routines to facilitate innovative behavior (Bessant et al., 2001; Jones and Craven, 2001). Studies have found that successful innovation requires both (technical) resources and organizational capabilities to manage them (Jones and Craven, 2001). In their ethnographic study, Jones and Craven (2001) identified ten new routines to increase a firm's innovation capability. These new routines were the following: literature scan, customer contacts, trade shows, idea capture form, NPD committee, competitor price check, customer input, supplier input, reverse engineering, and prototype development. They focused on two of these: the new idea capture form and the NPD committee routines. Their key finding was that a change in organizational routines could substantially improve the firm's performance regarding improved revenue generation and customer perception. Furthermore, they suggest that routines help understand the critical difficulties associated with the management of innovations. The present study was set out to answer the following research question: *How does a manufacturer manage its innovation process at the micro-level to facilitate smart solution development?*

## 3. Method

### 3.1. Research strategy

The study builds on an in-depth, single-case study. The research strategy was applied because it captures the complex phenomenon of SSD and its underlying organizational contingencies of micro-level innovation processes, routines, and practices (Dyer and Wilkins, 1991; Eisenhardt and Graebner, 2007; Siggelkow, 2007). We chose Wärtsilä, an incumbent actor in the global shipbuilding scene, as the focal company as it had recently renewed its innovation process to address the integration challenges regarding complex product-service-software solutions. While the innovation process for smart solutions comprises the unit of analysis in this study, our case study also has a component of action research because one co-author was actively involved in renewing Wärtsilä's innovation process. Action research comprises a participatory form of qualitative inquiry that aims at balancing between action-reflection and theory-practice for understanding and creating practical solutions to the prevailing problems, that is, how to overcome the challenges regarding smart solution development (Stringer, 2007).

### 3.2. Case description and selection criteria

The present study analyzes the execution of Wärtsilä's new innovation processes, routines, and practices, through an action research method (Reason and Bradbury, 2001). Wärtsilä is a Finnish-based, international technology company developing and selling smart energy solutions for the marine and energy sectors. Wärtsilä has made a successful transition from selling pure technology to selling customer solutions (see Salonen and Jaakkola, 2015), including development and sales of operations and maintenance (O&M) solutions, performance-based contracts (Korkeamäki and Kohtamäki, 2020; Visnjic et al., 2018), and a wide array of services (e.g., lifecycle and digital services). Services accounted for 50% of the corporation's revenues in 2018. Lately, digitization has started impacting Wärtsilä's customer industries heavily, and Wärtsilä has been active in developing its digital offerings by hiring software professionals (e.g., Chief Digital Officer/CDO), making software-based acquisitions (e.g., Eniram), and

allying with start-ups and software companies (e.g., through a smart technology hub). Today, Wärtsilä describes itself as a global leader in smart technologies and complete lifecycle solutions. Furthermore, Wärtsilä attempts to maximize both environmental and economic performance of their solutions by emphasizing sustainable innovation, total efficiency, and data analytics (Wärtsilä, 2020).

We selected this company because it is one of the leading solution providers in its sector; the firm has servitized some time ago, offers smart solutions for global markets, and initiated new innovation processes. Furthermore, Wärtsilä currently must develop smart solutions (e.g., engine-as-a-service and fleet/voyage/vessel efficiency solutions) to address exogenous changes (e.g., stiffening competition, regulatory policies, changing customer needs, and fast technology development) and internal pressures (e.g., profitability requirements from the investors/owners). Thus, the company provides a powerful case (Siggelkow, 2007) of smart solutions and an opportunity to develop interesting in-depth insights (Dyer and Wilkins, 1991). Furthermore, one of the research team members was one of the leading developers of its innovation process during its establishment. In contrast, other research team members have over ten years of experience collaborating with the case company on servitization and business development issues. Thus, we undertook an insider-outsider approach to conduct this qualitative research and attempted to maximize the benefits (obtaining an in-depth understanding of a subject through an insider view) and minimize the disadvantages of such an approach (gaining objectivity through an outsider view; see Dwyer and Buckle, 2009).

### 3.3. Data collection

We started our research in 2016 by conducting 12 senior manager interviews between 2016 and 2018 to better understand Wärtsilä's business landscape, overall strategy, and strengths in the solution business (see the questionnaire in Appendix 1). This stage provided us with insight into Wärtsilä's key challenges, opportunities, and possible market directions. In spring 2017, Wärtsilä launched its new innovation model. Two and half years after the new innovation model was launched, we conducted 11 senior manager interviews to gain an in-depth micro-level understanding of the innovation process (see the questionnaire in Appendix 2). Respondents were selected as informants because of their extensive experience throughout the firm's history and their in-depth knowledge of innovation processes. These interviews ranged from 40 to 95 min, with an average interview lasting approximately 64 min. These managers were responsible for developing or executing an innovation model for Wärtsilä. Altogether, we interviewed 23 Wärtsilä's managers responsible for innovation to understand the key purpose of the new model, potential challenges related to the establishment of this model, and the early effects of this model. This effort resulted in 374 pages of transcribed text and information on routines and associated activities and practices regarding the new innovation model. Table 1 shows the primary data utilized in this study.

In addition to collecting primary interview data, we collected extensive secondary data from public sources (e.g., websites, annual reports, press releases, firm histories, and executive speeches). Furthermore, we obtained access to the firm's internal strategy documents to observe internal training material regarding the new innovation process. Hence, triangulation combining various sources of active and passive data was applied to corroborate the accuracy of the data (Yin, 1994), increase the reliability of our study (Beverland and Lindgreen, 2010), and identify different aspects of the phenomenon under consideration (Dubois and Gadde, 2002).

### 3.4. Data analysis

We employed a content and thematic pattern matching method (Yin, 1994) to analyze the data. First, we analyzed Wärtsilä's general servitization process and associated organizational capabilities and routines

**Table 1**  
Primary interview data sources.

First interview round 2016–2018		Second interview round 2019–2020	
Job title	Relevant Industry Experience (years)	Job title	Relevant Industry Experience (years)
Business Development Director	N/A	Senior Project Manager*3	20
Sales and Business Development Director	19	GM1, Innovation	12
Director 1, Solutions	31	GM2, Innovation	28
Director 2, Solutions	19	Program Director	26
O&M Director	20	GM, Innovation process	24
General Manager (GM), Sales Operations	19	Director, Operations	18
Development Manager	20	GM, Ecosystem Innovation	17
Strategic Alliances Manager	12	Service Designer	2
Digitization Director	14	Innovation Manager	14
Service Unit Director	23		
Marketing Director	38		
Maintenance Director	20		
<b>Average</b>	<b>21.36 years</b>	<b>Average</b>	<b>17.89 years</b>
<b>Median</b>	<b>20 years</b>	<b>Median</b>	<b>18 years</b>

regarding solution business management based on the first interview round. This information gave us insight into general challenges and opportunities regarding servitization within an incumbent manufacturer. Second, during the second interview round, we focused specifically on innovation management and the initial reasons for Wärtsilä to establish a new innovation model. This knowledge gave us an in-depth insight into the initial triggers and drivers behind the initiative and challenges related to the new model establishment. Then, we analyzed key organizational processes, routines, and practices that Wärtsilä used to overcome particular challenges in smart solution design, development, and execution. We also obtained knowledge of the outcomes of the new innovation process. Finally, we coded the interviews based on interviewees' responses regarding innovation process development. These codes were compacted into first-order themes describing interviewees' initial language use (Nag et al., 2007). The second-order themes concentrated on analyzing these first-order themes, indicating researchers' thematic analysis of the data. The last step, the aggregate dimension, represents the most abstract analysis dimension. In this case, aggregate dimensions were converted into six different themes, namely, 1) drivers, triggers, and challenges of SSD, 2) innovation processes, 3) innovation routines, 4) innovation practices, 5) co-alignment of processes, routines, and practices, and 6) outcomes of smart solution development. Innovation processes, routines, practices, and their co-alignment has been grouped in Fig. 1 because they represent primary mechanisms used to overcome the challenges regarding SSD. The figure below illustrates the study's general data structure and describes the coding and reasoning process.

## 4. Findings

The chapter investigates the drivers, triggers, and challenges of SSD, scrutinizes the processes, routines, and practices of the SSD, and finally, demonstrates some of the outcomes of the emerging smart solution innovation processes.

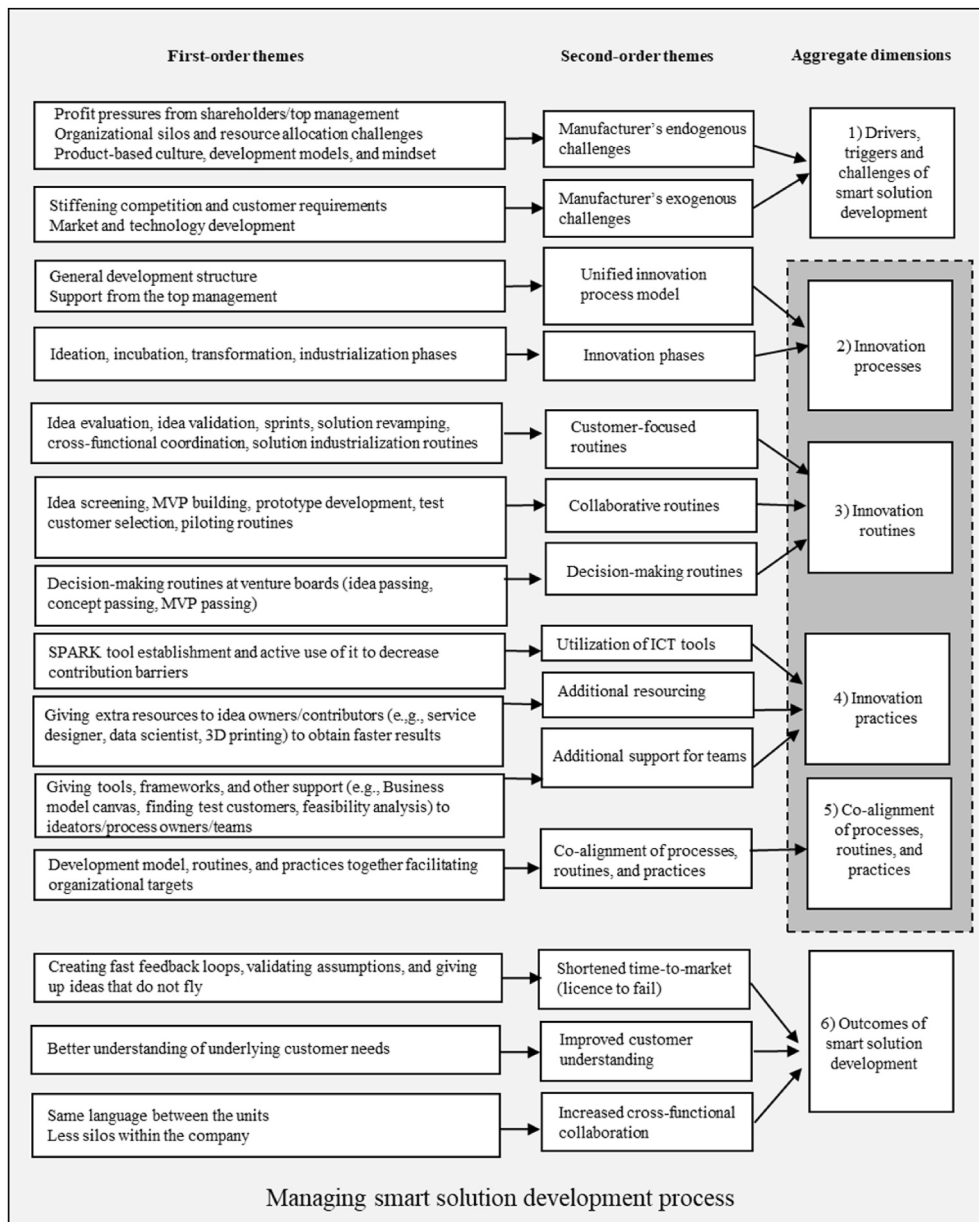


Fig. 1. Data structure of the study.

4.1. Drivers, triggers, and challenges of smart solution development

The studied company, Wärtsilä, has a history as a product manufacturer and system supplier, located distant from its (end) customers. We begin the scrutiny from the challenges faced by Wärtsilä when transitioning towards smart solutions. Here, the emphasis is on those challenges that shape the smart solutions development process. One obvious challenge stemmed from continuous profit pressures from the stock owners and investors as one GM2 (innovation) explained: “EBIT targets are very high. If Microsoft makes 98% EBIT with their Office licenses. The fact is that in an engine business, this level is never possible ... But sure, everybody thinks that in order to improve EBIT, we must start to make software”.

One GM2 (innovation) introduced this positioning problem within the value system as follows: “Customer understanding is very thin there, which stems from Wärtsilä’s position. It’s basically a component provider [from their clients’ perspective], and end customers are far away from them.” Wärtsilä’s product-based DNA was described in one public document as follows: “Our roots are in engines, engineers’ knowhow, and in

the equipment”.

Wärtsilä is a traditional product company with a traditional engineering mindset that focuses on developing cutting-edge products and revamping product features. However, this engineering mindset is not always aligned with customer needs and preferences. An interviewed GM2 (innovation) stated this very frankly: “When I came to Wärtsilä, I had one customer meeting in the first month ... So it’s not a surprise that you don’t have any clue about customer’s needs and preferences ... Customer is a very, very distant creature there.” Another product-focused cultural issue is that the previous development models have been built for developing products that are typically time-consuming processes. In manufacturing companies, services are typically developed using models dedicated to R&D work and traditional product development (Kowalkowski and Ulaga, 2017). This product heritage was also present at Wärtsilä; several interviewees stated that this old modus operandi had led to organizational rigidities and long development cycles: “The previous model we had was quite heavy and rigid. Of course, that gives us the foundations that we need, but I think we should become more agile” (Innovation Manager).

Some manufacturing firms have established different process models

to develop services and software (Kowalkowski and Ulaga, 2017). At Wärtsilä, the GM2 (innovation) highlighted the need to possess general and unified structures to develop new innovations: “*You need to have a clear structure and process [to drive innovations].*” Separate organizations and development models for products, services, and software have been found successful and effective ways to manage service transition in the existing servitization literature (Davies et al., 2006; Gebauer et al., 2010; Immelt, 2017; Neu and Brown, 2005) because they legitimize manufacturers to develop products, services, and software as stand-alone businesses (Oliva and Kallenberg, 2003). However, these separate structures may lead to disintegration challenges, tensions, and clashes between the profit-and-loss responsible units (P&L) because of conflicts of interest and distinct organizational cultures (Kowalkowski and Ulaga, 2017). At Wärtsilä, some respondents saw this as a problem, as one innovation manager said: “*We should have mutual targets. But now this is difficult because all the product lines have their own profit-and-loss responsibilities*”. Another senior project manager acknowledged the danger of silo effects related to the use of different key performance indicators (KPIs): “*In the management system, these different KPIs provide good preconditions for silo effects. If you look at your own KPIs that demonstrate only your performance, the danger of silo effect is very true*”. Hence, there was some disagreement among the managers regarding whether this was a concurrent problem or not.

With regards to exogenous challenges, several respondents stated that the surrounding business environment is becoming more volatile for several reasons (e.g., increased competition, digitalization, legislation, the convergence of industries). For instance, one executive (Senior Vice President) phrased this challenge in an internal document as follows: “*The world around us keeps changing. Today’s business environment is rather volatile, and the ability to precisely predict the future is becoming more and more challenging*”.

To conclude, based on the extensive data collected, Wärtsilä had challenges concerning positioning in the value system (upstream position), lack of in-depth customer understanding (stemming from culture and geographical location), product-oriented organization culture (stemming from history), rigid and slow development models (stemming from established product development processes), and organizational inertia between P&L units and product lines (stemming from separate organizational structures and various incentives for products, services, and software). Therefore, to overcome both endogenous and exogenous challenges, Wärtsilä established a new innovation model to increase customer understanding, agility, and intra- and interfirm collaboration.

#### 4.2. Innovation processes, routines, and practices for smart solutions

To overcome these challenges mentioned above and create a synchronized innovation model, Wärtsilä launched its new innovation process model in spring 2017, developed with one large consultancy company. Top management gave strong background support to this since its initial target was to establish new work habits and legitimize this new innovation model, as stated by one GM2 (innovation): “*To make this kind of a corporate innovation model work, you need to have a top management commitment*.” Furthermore, to address the problem related to lack of customer understanding and product-driven culture (engineering mindset), Wärtsilä initiated taking the customer perspective into account at the beginning of the process: “*I would always like to get, and that is my target, to get always customer on board*” (Innovation Manager).

Furthermore, to address collaboration challenges, there was cross-functional coordination along the phases to obtain different viewpoints across the business unit: “*So it’s not a fixed panel that decides. It really depends. If it’s an idea more on the energy side, obviously, there should be more people from energy on the decision board. If it’s from the marine side, more marine, but we always try here to be cross-business. To have all different businesses represented in there, because even if it is an energy idea, somebody in marine might still think it’s valuable because they can learn something from it, so they can make a small investment as well*.” (GM1, innovation).

Table 2 shows Wärtsilä’s new innovation process with 5 phases (a) ideation, b) incubation (optional), c) transformation, and d) industrialization. It includes 14 innovation routines, practices, and underlying targets behind each of the routines. We classified innovation routines into 1) collaborative routines, 2) customer-focused routines, and 3) decision-making routines. Six of the identified routines were collaborative, five were customer-focused, and three were decision-making routines. We acknowledge that these 14 routines are not discrete since some overlap and interact with different categories. For instance, idea passing is primarily a decision-making routine, even though the decision-making routine involves mutual coordination and collaboration at the venture board. Categorization has been made based on the routine’s primary function (steer decision-making, taking customer perspective into account, or facilitate cross-functional collaboration). These routines and practices are discussed under each smart solution development phase.

##### 4.2.1. Routines and practices regarding ideation

The idea screening routine encompasses ways to collect ideas across the organization (and increasingly also from external contributors). One identified problem was that the ideas tended to come from the same group of people as one GM1 (innovation) put it: “*To enable and empower everyone in the company to bring their ideas [...] to go through the process. So it’s also a cultural challenge. How do you make sure that you enable, upskill the people to be part of it? We’ve seen in innovation that the same group of people always contribute. They come up with the ideas and implement the ideas. It’s not the smallest group, but it’s more or less the same group of people, but there are great ideas and great capabilities among all the other people. So that’s why it’s important to have the barriers quite low*.” A key managerial motivation was thus to increase the number of ideas in the pipeline and generate a “critical mass” of ideas since only 1–2% of the ideas proceeded eventually into the industrialization phase. Already in this phase, Wärtsilä wanted the customer perspective to be included: “*Understanding the customer perspective already in the very beginning, that’s what we try to cherish*” (Director, Operations).

Managers wanted to decrease barriers to contribute and established new social-media-based tools to collect, comment, and evaluate the ideas: “*Our idea management tool is called SPARK internally. So you know, you have jump starter to put the SPARK. It’s like ... a story of different support tools, that come together, because one thing that is very important in Wärtsilä, and I think is getting more important everywhere, is how we communicate*” (GM1, Innovation). This idea evaluation routine’s incentive was to develop ideas further through more intense collaboration, enabled by new digital technologies. One target was not to leave the ideator alone with their idea but bring complementary resources to help them to take it further.

Idea passing is a decision-making routine where the venture board decides whether to proceed with the idea or reject it. According to the interviewees, 90% of the ideas were rejected, and only 10% of the ideas proceeded to the following stages. These numbers were based on experience, but they were also used to manage expectations inside the company. The critical question related to decision-making was to decide if the idea has value worth further pursuing. The more that customers were already included in this phase, the more likely it was to succeed and enabled Wärtsilä to develop solutions faster, as one innovation manager phrased it: “*Maybe customer could accelerate this development too, we should always have a customer with us [when developing new solutions]*”.

##### 4.2.2. Routines and practices regarding incubation

Idea validation refers to a collaborative routine that targets the idea’s feasibility faster through additional resourcing. Wärtsilä provided extra resources for the teams in the form of market research and a service designer. The GM1 (innovation) justified this practice as follows: “*We want to enable and empower the people to bring them [ideas] forward. So, what we do is throughout the phases, we give him the additional resources that*

**Table 2**  
SSD processes, routines, and practices at Wärtsilä.

Innovation process phase	Innovation routine (routine type)	Organizational practices	Organizational target
Ideation	Idea screening (customer-focused routine)	Encouraging personnel to contribute new ideas across the organization through the SPARK tool, physical boxes, and jump starter	Decreasing barriers to contribute to ideation. Generating more ideas from an increased number of contributors across the organization. The idea should contain the customer perspective to increase the likelihood of success
	Idea evaluation/ community discussion/cross-functional coordination (collaborative routine)	Encouraging personnel to evaluate and comment on ideas (e.g., through SPARK tool) Providing feasibility analysis and business model canvas to support ideation	Increasing intrafirm collaboration and develop the ideas further (making ideas better)
	Idea passing (decision-making routine)	Regular venture board meetings to reject (~90%) or pass the ideas (~10%)	Clear decision-making structure (is the idea value worth further pursuing?) to proceed
Incubation	Idea validation (collaborative routine)	Providing service design and market research resources to support teams. Promoting license-to-fail culture	Obtain faster results about idea's feasibility
	Business case/ sprint building (collaborative routine)	Allocating more resources to ideators/process owners. Simulations to test the concept	Shorten innovation cycles
	Concept passing (decision-making routine)	Regular venture board meetings to decide what to do with the concept	Clear decision-making structure (has the idea been validated with customers and the business division to continue building MVP?) to proceed
Transformation	MVP building (customer-focused routine)	Allocating resources to develop MVP and test if the customer is ready to use it. Building small scale models	Increase organization's agility and clock speed
	Prototype development (customer-focused routine)	Allocating resources to prototype development (e.g., use of 3D printing)	Increase organization's agility and clock speed

**Table 2 (continued)**

Innovation process phase	Innovation routine (routine type)	Organizational practices	Organizational target
Industrialization	Test customer selection (customer-focused routine)	Providing support to find a test customer	Increase organization's agility and clock speed
	Piloting/showcase building (customer-focused routine)	Providing support for piloting and showcase building	Increase organization's agility and clock speed
	MVP passing (decision-making routine)	Regular venture board meetings to decide what to do with the MVP	Clear decision-making structure (Has this MVP's urgency been validated by customers and the business division to justify its launch and continue larger-scale development?) to proceed
Industrialization	Solution development/ revamping (collaborative routine)	Encouraging solution's mutual development	Developing a solution in a way that will most likely succeed
	Cross-functional coordination (collaborative routine)	Aligning and fitting with existing offerings	Fitting with existing offerings
	Solution industrialization (collaborative routine)	Supporting pricing, productizing, and selling the solution	Increase firm's sales and profitability

he needs to do that. So a normal team of ... might be two or three experts from the business, but we then give them a service designer, more of a strategist, more of a ... depending on what they need: data scientist, whatever. To support them and give them additional skills to reduce the uncertainties. Because we also say, of course, we can't expect that everyone in the company is great at developing business models, prototypes, developing a different kind of strategies, etc."

Business case and sprint building (time frame in which the task must be executed – in this case, the sprint can take three weeks) were routines established to shorten the firm's innovation cycle. Wärtsilä used simulations to validate the idea's potential, as the senior project manager stated: "We will use more simulations ... we can validate through simulations". One innovation manager declared collaboration advantages of using sprints: "We had one sprint that lasted for one week. That lasted one week because we printed one metallic version of the component ... This is a good way to familiarize people with the new way of working. Networking is just great. This is great because people are forced to discuss with each other."

Concept passing is a decision-making routine where the venture board regularly decides if the concept has been validated with customers and the business division to continue building a minimum viable product (MVP). If the concept passes this stage, the MVP building routine takes place. This customer-focused routine has been created to increase the firm's clock speed and agility. "I usually like to call it not MVP, but MSP. So for me, it's the Minimum Sellable Product. Not just one that is, you know, technically feasible, but actually something that a customer could use." (GM1, innovation).

4.2.3. Routines and practices regarding transformation

Prototype development, test customer selection, and piloting were all customer-focused routines that aimed to facilitate the firm's agility by giving straight feedback on how well the customer adopts it (is there actual demand for it?). The GM1 (innovation) highlighted the

importance of these routines to show that the organization can perform them and develop businesses out of the idea: *“But the main point about the transformation is to make it happen. Find, for example, test customers, do prototyping, do validation, maybe first in a test environment and then in a live environment. To actually showcase that you can do it and in a way to prepare to do a business out of the idea.”*

MVP passing is a decision-making routine that addresses the following question: Have customers and the business division validated this MVP’s urgency to justify its launch and continue larger-scale development? Therefore, to continue larger-scale development and productization, there must be a clear indication of demand and expected profitability.

#### 4.2.4. Routines and practices regarding industrialization

Solution development and revamping is a collaborative routine that targets increasing the likelihood that the solution will succeed. The GM (innovation process) highlighted the importance of mutual development of solutions: *“We develop technologies that can be transferred to other products and become productized. At this point, this is part of our research and technology project. In this forum, there are sales units, maintenance, and technology units involved. And these projects are prioritized.”*

Cross-functional coordination is another collaborative routine that addresses how a new solution fits with existing offerings and how different units support solution sales. Service Designer stressed that many projects require different teams to work together: *“... the type of projects at least within I’ve been working on require different teams to work together.”* The GM1 (innovation) presented questions that need to be considered: *“And that’s where it becomes really complicated because there are of course very different, different ways how, what we can do. How do we spin it to the existing business? There are lots of questions: how do we actually start selling it? How do we make sure that our sales support it? How do we make sure that we can use an economy of scale for this? How can we actually productize it to make it? How can we bring it into our existing product-service bundles? How can we include it in our offerings?”*

The solution industrialization routine aimed to increase new solution’s sales and profitability. The GM2 (innovation) emphasized the importance of industrializing new solutions as soon as possible: *“We should always think about the sales channels and how this productization takes place – this should always be industrialized”*. Another innovation manager noted that quality issues become vital at this point: *“This is going to a heavier process because it will be productized. Quality issues must be checked then.”* Table 2 above shows Wärtsilä’s new innovation process, routines, practices, and underlying targets behind each of the routines.

#### 4.3. Outcomes of smart solution development

Even though the innovation model was relatively new when conducting the research, respondents identified early-stage outcomes derived from the new model and associated routines and practices. One outcome was that Wärtsilä was able to shorten the time-to-market of new smart solutions, as one GM1 (innovation) responded: *“... people from that other corporation said, ‘It’s amazing, what we did here in three weeks, we would usually need six months for it.’”* In addition, through the new model and associated practices, Wärtsilä was able to increase its clock speed and strategic agility, as the following quote from the GM (innovation process) demonstrates: *“We have had these max. four days sprints where ideas were evaluated in collaboration with experts. During this time, the process owner or ideator got an understanding if this idea was a very good one or if it didn’t work.”* This quote emphasizes the importance of sprints to verify the idea’s functionality. Additionally, the internal strategy document highlighted the need to create fast feedback loops and experiments, and increase agility by suggesting: *“Create fast feedback loops, validate your assumptions by experimenting in early phases, and give up on ideas that don’t fly.”* This requirement was reminiscent of the “license to fail” thinking to speed up development.

Another outcome was improved customer understanding across the organization. This increased customer understanding had evolved as the complexity in the surrounding business regime had increased. One director (operations) formulated this as follows: *“When this world is becoming more and more complex ... and when it’s about solutions, not just about engines ... Today, we need to understand those customer needs much better before we decide what we are about to develop.”* Coercive structures, e.g., in decision-making routines, were designed to take the customer perspective and understanding into account when developing smart solutions.

Third, the increased cross-functional collaboration led to faster development cycles and increased mutual understanding between the units. One GM (innovation process) observed that this increased collaboration resulted in shared language across the organization that helped them allocate resources more effectively: *“To communicate within Wärtsilä ... we have to use the same language. Otherwise, we don’t understand each other. We have understood that we need to change our language ... We can’t expect that others would learn our language because that’s not happening. We are competent enough to learn this new language. We have noticed that we go through these common phases because that helps us to steer the money and prioritize”*. Concerning fewer silo effects, one senior project manager noticed that there is a continuous swing between separate silos (separate structures and incentives) and non-silos (integrative structures and incentives): *“This pendulum is now moving to another direction, toward non-silo effects, and it’s probably moving to a wrong direction again. So it will move back someday.”*

All in all, these new integrative routines and practices have several implications for Wärtsilä. Based on our data, Wärtsilä has shortened solutions time-to-market, increased its strategic agility and customer understanding, and facilitated cross-functional coordination and development by establishing new routines and practices.

## 5. Discussion and conclusions

### 5.1. Theoretical contributions

The present study was set out to investigate how a manufacturer manages its innovation process at a micro-level to facilitate smart solution development. We studied an industrial company’s development processes, routines, and practices to understand how the solution provider could improve SSD and overcome rigidities related to bundling products, services, and software. In this context, the contributions of this study to the digital servitization and specifically to the PSI literature are threefold: this study 1) identifies a set of innovation routines, categorized as collaborative, customer-focused, and decision-making routines, 2) demonstrates several innovation processes and practices associated with those routines, and 3) highlights the co-alignment of innovation processes, routines, and practices to drive SSD to achieve faster development cycles (shorter time-to-market), increased customer understanding (improved success of new solutions), and better intrafirm collaboration (fewer silo effects).

Therefore, this article extends the digital servitization (Coreynen et al., 2020; Hsuan et al., 2021; Kohtamäki et al., 2019; Sklyar et al., 2019) and, more specifically, the PSI literature (Bustinza et al., 2021; Vendrell-Herrero et al., 2020) by identifying 14 micro-level innovation routines and associated practices in SSD. The innovation routines open up the black box of SSD processes and reveal how an incumbent firm attempts to overcome the integration challenges regarding the product, service, and software integration in micro-level scenarios, thus addressing the call by Schaarschidt et al. (2018), who ask for studies to investigate how goods and service innovations are aligned. We categorized these innovation routines into collaborative, customer-focused, and decision-making routines based on the routine’s primary function. Six of the routines were collaborative routines, whereas five were customer-focused routines, and three were decision-making routines. Collaborative routines were established to increase mutual coordination

and collaboration within the company and decrease silo effects, thus supporting previous findings from Porter and Heppelmann (2015) about the benefits of cross-functional practices when developing smart solutions.

This article also addresses the call by Bond III et al. (2020), who have encouraged researchers to study how smart elements can help firms cut organizational silos and silo thinking within focal companies. Establishing collaborative routines is one way to overcome problems stemming from separate P&L units and their contradictory targets. In this regard, the study makes explicit the structural challenges stemming from the dominant structural arrangements. In line with previous servitization studies (Davies et al., 2006; Gebauer et al., 2010; Huikkola et al., 2020; Neu and Brown, 2005; Oliva and Kallenberg, 2003), we acknowledge that separate structures lead to efficiency benefits. However, they also lead to silo effects. Hence, instead of suggesting that manufacturers should re-establish integrated organization structures, we propose that companies benefit from establishing collaborative routines and practices (e.g., a cross-functional steering group) in the smart solution design phase to mitigate the rigidities. Customer-focused routines aimed to provide an increased understanding of the customer's underlying needs and preferences.

Our finding supports previous new solution development studies (Johansson et al., 2019) that suggest that smart solution providers should pay special attention to fostering customer interaction and participation to drive innovation performance. These routines were established to break the company's product-related path dependency, and this study acknowledges that routine development plays a central role in overcoming this rigidity, advancing our understanding of how manufacturers align their product and service innovations, hence addressing the concerns in recent studies that have investigated solution innovations (Schaarschmidt et al., 2018). Decision-making routines were established to give a more explicit structure to steer the firm to make a go/no go decision at venture boards. Decisions are made based on idea's/concept's/solution's endogenous (e.g., profitability) and exogenous factors (e.g., customer acceptance). To concretize these considerations and support further research, we formulate general propositions:

**Proposition 1.** *Smart solution development comprises integrated and synchronized product, service, and software innovation processes.*

**Proposition 2.** *Smart solution development requires a synchronized innovation process instead of tailored product, service, and software innovation management processes.*

As a second theoretical contribution, this study contributes to the existing, mainly quantitative, PSI literature (Bustinza et al., 2017; Tian et al., 2021; Vendrell-Herrero et al., 2020) by extending the concept of PSI by emphasizing the software in parallel with products and services, and by providing rich and in-depth information of the micro-level integration issues through a single-case qualitative study. In addition to the integration of products and services, smart solution providers must acknowledge the importance of software already in the solution design phase, thus extending the concept of solution or hybrid offering innovation (Johansson et al., 2019; Schaarschmidt et al., 2018) by suggesting that software is equal to products and services within manufacturers. Thus, the software can be considered as having its own entity, not only embedded in products and services as commonly stated in the servitization studies (Ulaga and Reinartz, 2011). This idea challenges the manufacturer's existing innovation routines and practices by steering attention to the adoption of agile software logic that emphasizes recurrent testing, validation, and iteration processes and practices. Taking the software element into account already in the design phase is profound for a manufacturer since the development routines, cycles, and rhythms become faster, indicating the need to apply agile methods in their development, thus extending our knowledge of integrating software development in the manufacturing sector (Hsuan et al., 2021;

Rigby et al., 2016). Manufacturers have also adopted and benchmarked specific practices such as MVP and the "lean start-up approach" from the software sector that facilitate this increased organizational agility and overall clock speed. This evidence extends our knowledge of how manufacturers can become less hierarchical and more agile by emphasizing and adopting software development practices. When Immelt (2017) has called for this requirement, this study explicates how this agility is achieved through integrative processes, routines, and practices. These considerations led us to build the following propositions:

**Proposition 3.** *The structural and process-based differences between product, service, and software innovation processes require their co-alignment to attain an effective smart solution development process.*

**Proposition 4.** *The alignment of product, service, and software innovation processes for smart solution development manifests through innovation routines and practices.*

As a final contribution, this article contributes to the new solution innovation literature (Johansson et al., 2019; Schaarschmidt et al., 2018) by demonstrating that smart solutions emerge from the co-alignment of innovation processes (a synchronized process for product, service, and software development), routines (collaborative, customer-focused, and decision-making routines), and practices (establishment of ICT-systems, support through additional resourcing and tools). By emphasizing the co-alignment of innovation processes, routines, and practices, we develop the concept of SSD. Fig. 2 illustrates the general framework for managing SSD, including drivers and triggers for such an initiative.

Our findings go beyond the innovation process and stage models (Gremyr et al., 2014; Kowalkowski and Kindström, 2012) by highlighting the importance of co-alignment and the dynamic interplay between innovation processes, routines, and practices concerning products, services, and software development. This co-alignment helps firms to achieve improved performance and outcomes. In particular, this co-alignment extends our knowledge of solution innovation capability (Schaarschmidt et al., 2018) by demonstrating that this product-service-software alignment capability stems from co-alignment of processes, routines, and practices already in the smart solution design phase. These considerations led us to formulate final propositions:

**Proposition 5.** *Product, service, and software co-alignment leads to decreased transaction costs and mitigates rigidities through improved collaboration.*

**Proposition 6.** *Co-alignment of innovation processes, routines, and practices improves customer knowledge usage and leads to faster development cycles (shorter time-to-market).*

**Proposition 7.** *Co-alignment of innovation processes, routines, and practices improves a firm's innovation performance.*

## 5.2. Managerial implications

This study demonstrates how a large international solution provider organizes SSD. Managers from diverse business disciplines can benchmark processes, routines, and practices established by Wärtsilä to shorten solution time to market, increase customer understanding, and facilitate cross-functional collaboration and coordination. We suggest that managers should strive to go beyond the innovation process and pay particular attention to maintaining the constant co-alignment of innovation processes, practices, and routines.

The focus on co-alignment of innovation processes, practices, and routines may also facilitate managers in identifying critical bottlenecks related to smart solutions. For instance, managers must break away from the efficiency logic of pure product and service innovations and emphasize collaboration between the various organizational (P&L) units (products, services, software) to generate lifecycle benefits instead of advantages related to instant product sales. This idea leads to a

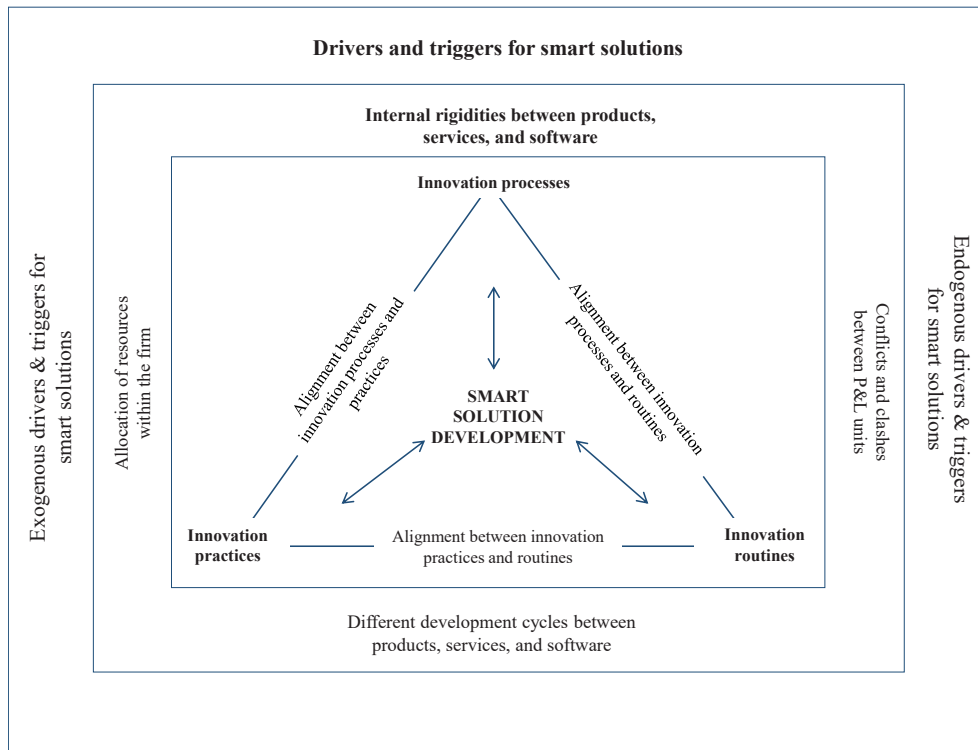


Fig. 2. Co-alignment of innovation routines, processes, and practices to develop smart solutions.

reconsideration of optimal structures for driving smart solutions.

Managers should align innovation processes for product, service, and software innovation to facilitate the development of smart solutions. Such a synchronized model provides a common platform and base logic to be fine-tuned by managing the underlying practices and routines to nurture different business units and product line collaboration.

## 6. Limitations and future research

As with any research, this study has limitations that are important to recognize. In single-case studies or qualitative studies in general, no statistical generalizations can be made (Eisenhardt and Graebner, 2007). Nevertheless, the analyzed process of the focal company's smart solution development process is essential and meaningful to serve as a setup for contextual understanding and an arena for theorizing. In terms of the case research strategy (Eisenhardt, 2021), the study aims to generalize the study results to the conceptual, not the empirical, domain. In addition, the purpose of the paper is to offer a theoretical generalization of identifying and conceptualizing the types of processes, routines, and practices that an established manufacturing company applies in its SSD initiatives. Such a theory development purpose of the study manifests in the set of propositions offered to inspire and guide

further research, rather than provide law-like generalizations of the findings to cover a particular population of firms (Yin, 1994). These findings may have relevance to other firms that share Wärtsilä's characteristics and environmental conditions, such as providing project-based and technology-driven solutions. However, the generalization should be made with care since the specific empirical properties regarding the theorized conceptualizations may vary between companies, industries, and countries, and thus implementing these conceptualizations to empirical studies requires respective operationalization.

Future studies could delve deeper into this subject by utilizing comparative and multiple case study methods to study specific SSD patterns (Eisenhardt, 2021). Future studies could also evaluate management heuristics in open product-service-software innovations; what types of simple rules have they created to run this process successfully? Moreover, future studies could study the role of expert heuristics in new product-service-software innovations and determine what experiences have taught managers to foster smart solutions, that is, what actual content have firms learned when managing servitization-driven innovations. Finally, this inquiry would address organizational decision-making — how do managers make yes-or-no decisions in practice based on experience?

## Appendix 1. Semistructured interview template (2016–2018)

**Appendix 1.** Semistructured interview template (2016-2018).**Semistructured interview template for senior managers (2016-2018)**

What type of strategic practices are utilized to drive strategic change toward solutions?
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**Interview questions:****A. Respondent's background**

1. How would you describe your current position and your journey to it?
2. If you were selling the firm's strategy, products, services, business model, strengths, and weaknesses to outsiders, such as new shareholders who are not familiar with the industry yet, how would you describe them?

**B. Service business development in manufacturing companies**

3. How would you describe the role of services for your company?
4. What kind of tensions or dilemmas you have faced when implementing your service strategy? Please tell some examples of those challenges.
5. If you described the firm's success and competitive advantage, what are the underlying factors behind them? Why has the firm become so successful?
6. How have your competencies changed over the years?

**C. Strategy work**

7. What issues are emphasized in your strategy? How have these focus areas changed over the years?
8. What kind of practices are utilized in the firm's strategic management?
9. How would you describe your strategy work? What strategy tools do you use?
10. How would you describe strategic thinking in your firm? How has this evolved?
11. What issues are particularly challenging when making strategic decisions? Could you please tell some examples?

**D. Smart solutions and dynamic capabilities**

12. How do you see the role of new digital technologies such as IoT for your firm in the future?
13. What is the role of the Internet of Things in your strategy?
14. What new competencies are required when digitizing your offerings?
15. Do you need to change your mindset or ways of working when providing digital solutions?
16. How do you build or acquire those competencies?
17. What opportunities do digital technologies provide to you? Do you have any examples of these opportunities?
18. What external resources are critical for you when designing, planning, selling, and implementing digitally enabled solutions? Could you please provide some examples?
19. Have you had to release some assets in order to develop digital solutions?

**Appendix 2. Semistructured interview template (2019–2020)**

**Appendix 2.** Semistructured interview template (2019-2020).**Semistructured updated interview template for senior managers (autumn 2019→)**

What type of practices are utilized to facilitate product-service innovations?
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**Interview questions:****A. Background question**

1. Please describe Wärtsilä's (open) product-service innovation development process, how does it differ from traditional innovation process (e.g., in new product development (NPD) or R&D processes)?

**B. Ideation**

2. What are the key sources when you gather new ideas? How do customers, suppliers or third-parties contribute to new solution ideation? Any examples?
3. How do you elaborate new ideas? How do you decide that they could be worth taking further?
4. How do you evaluate the feasibility of new ideas? What kind of practices do you have?
5. How do you decide whether to reject or proceed with the idea? What kind of rules of thumb can be utilized in this?

**C. Incubation**

6. How do you prepare for incubation? How do you utilize other organizations in this phase?
7. How does the sprint takes place? What is the role of other organizations?
8. How do you build a business case? Who can contribute to this?
9. How do you decide whether to reject or proceed in this stage? How do you make sure that there is sufficient demand for this? What kind of practices have you found good to ensure this?

**D. Transformation**

10. How does the transition to a dedicated transform team take place?
11. Please describe the minimum viable product (MVP) development process? What is the role of external organizations when developing a MVP? How do you know if this will be viable or not?
12. What are good and bad practices for piloting MVP at the customer? Who should be the customer? How do you select it?
13. How do you decide whether to quit or proceed with this MVP? What metrics or rules of thumb do you follow when you decide if MVP will be eventually industrialized?

**E. Growth**

14. How do you decide what further development is needed in the industrialization phase? What is the role of external organizations in this phase?
15. When can you transition from a development team to an industrialization team? When is the solution good enough?
16. What practices have you identified good (or bad) when productizing the solution?
17. How do you learn from successes and failures within the organization and within the network?

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