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Interplay between Servitization and Platforms: A Longitudinal Case Study

Abstract

Purpose This paper aims to empirically explore the evolution of servitization and how platforms affect the transition between the stages of servitization.

Design/methodology/approach We conducted an in-depth case study of a Chinese manufacturer (i.e., Haier) using a longitudinal design. Three rounds of data collection were conducted between 2014 and 2020. We carried out 50 semistructured interviews and 11 workshops to collect data from senior and middle managers of Haier and its business partners.

Findings We found that Haier’s servitization journey includes three stages (i.e., product-oriented solution, integrated solution, and smart connected solutions) that evolves in the target of the services and the digital components of the solutions. Haier has also developed three types of platforms (i.e., service platform, supply chain platform and platform ecosystem) to support the implementation of servitization. The empirical evidence reveals that platforms can address the complexities that emerged when Haier implements the different stages of servitization as well as enable Haier to transition from one stage of servitization to the next.

Originality/value This study enhances the current understanding of the evolution of servitization and the roles of digital technologies in the transition between the stages of servitization. It also provides empirical evidence regarding how the platform approach enables the development of servitization. By clarifying the interplay between servitization and platforms, this study provides guidelines for managers on how to develop platforms to both advance and benefit from servitization.

Keywords: servitization, platform, digitalization, longitudinal case study
1. Introduction

Servitization refers to the process of manufacturers building revenue streams from services (Baines et al., 2017). Servitized manufacturers offer a marketable mix of products and services that are capable of jointly fulfilling customer demand (Tukker, 2004; Zhang et al., 2017). Over the past decade, an increasing number of manufacturers around the world have begun to pursue servitization and expanded business by adding customer-oriented services to their existing product offerings (Qi et al., 2020; Gebauer et al., 2021). For example, the number of Chinese firms that have adopted servitization increased from less than 1% in 2007 (Neely, 2008) to 38% in 2018 (Mastrogiacomo et al., 2019). The number of servitized firms in developed countries, such as Japan, the UK and France, also significantly increased in 2018 compared to in 2007 (Neely, 2008; Mastrogiacomo et al., 2019). Moreover, 75% of a sample of 60 European industrial engineering companies were found to plan to deliver more services in the next three to five years (PAconsulting, 2019).

Early adopters implement servitization by moving along the product-service continuum to transform their current business models into service-based business models (Tukker, 2004; Baines et al., 2009). Recently, researchers have noticed that an increasing number of leading servitized manufacturers have adopted innovative technologies, practices and processes to extend the boundaries of servitization (Palo et al., 2019; Paschou et al., 2020; Chen et al., 2021). First, manufacturers are becoming increasingly focusing on advanced services (e.g., customer support agreements and outcome contracts) that emphasize responsibilities over the extended product lifecycle, capabilities delivered through performance, and support of customers’ dynamic and evolving activities (Lightfoot et al., 2013; Baines et al., 2017; Cenamor et al., 2017). For example, 21% of 60 European industrial engineering companies were found to currently offer advanced services, and this number may increase to 58% in the
next three to five years (PAconsulting, 2019). Providing advanced services requires a broad range of knowledge and expertise, and hence, servitized manufacturers must build wider networks and establish and maintain collaborative partnerships with, for example, suppliers, general agents, distributors, retailers and third-party service providers (Coreynen et al., 2017; Rabetino et al., 2018). Such a network has a many-to-one structure, and partners all directly or indirectly participate in the provision of advanced services to customers. Servitized manufacturers usually provide resources to support their partners and coordinate network processes and operations by offering services to their partners, ensuring the quality and speed of the delivery of advanced services to customers.

Second, servitized manufacturers are increasingly investing in digital technologies to transform their offerings from a bundle of products and add-on services to digital solutions (Frank et al., 2019; Kohtamäki et al., 2019; Kamalaldin et al., 2020). Based on the hardware plus logic, such manufacturers develop smart connected products that embed sensors, hardware, software, sensors, data storage, ports and antennae to provide added value to customers through these digital features (Porter and Heppelmann, 2014). Such products have three core elements: physical components (i.e., the product’s mechanical and electrical parts), smart components (i.e., embedded operating systems and enhanced user interfaces) and connectivity components (i.e., wired or wireless connections with the product) (Porter and Heppelmann, 2014). Information can be exchanged between the product and its operating environment. Some functions of the product can exist outside its physical components. The smart and connectivity components of products allow manufacturers, for the purpose of amplifying the capabilities and value of physical components, to collect data on product conditions, performance and usage; control product functions; customize the user experience; enhance product performance; and conduct predictive diagnostics and maintenance (Porter and Heppelmann, 2014). Such products thus enable manufacturers to offer customers digital solutions by providing new data
resources, new functionality and capability, and a new set of strategic choices (Rajala et al., 2019; Kamalaldin et al., 2020; Chen et al., 2021).

Digital solutions significantly increase the variety and interdependency of solution components (Porter and Heppenmann, 2015); they require a manufacturer to develop new technology infrastructure and transform its value chain with new structures, processes and relationships (Porter and Heppenmann, 2015). However, digital solutions may entail significant transaction costs, as servitized manufacturers must configure various digital technologies and collaborate with a network of partners (Kohtamäki et al., 2019). The network approach for providing advanced services indicates that servitized manufacturers must collaborate with a growing number of external stakeholders (Eloranta and Turunen, 2016). Such an expanding network and interrelationships increase the variety and uncertainty of service processes (Kapoor et al., 2021). The exploitation of the growth opportunities enabled by digital solutions and advanced services is challenging because of the progressively higher requirements for technological capabilities and network orchestration of such solutions and services (Kapoor et al., 2021; Eloranta et al., 2021). Moreover, providing digital solutions and using the network approach usually result in higher solution development and delivery costs and require investments in advanced technologies and the management of interorganizational relationships (Cenamor et al., 2017; Eloranta and Turunen, 2016). Therefore, digitalization and the network approach for providing advanced services may generate complexity regarding the operations and networks of a servitized manufacturer (Baines et al., 2020; Zou et al., 2018). If a servitized manufacturer cannot effectively manage such complexity, then it may suffer from the service paradox (i.e., investments in extending servitization do not generate the expected correspondingly higher returns) (Gebauer et al., 2005) or even choose deservitization to withdraw from providing digital solutions or advanced services and revert to the product-service continuum (Valtakoski, 2017).
Researchers have argued that servitized manufacturers can overcome complexity by leveraging a platform approach (Cenamor et al., 2017; Gebauer et al., 2020; Eloranta et al., 2021). Platforms include a set of shared core technologies that support value cocreation through specialization and complementary offerings (Thomas et al., 2014). Based on modularity and technology-enabled networks, a platform provides a structure on which business partners can develop compatible standards and coordination processes to search, identify, combine and share resources in the network (Thomas et al., 2014). Thus, a platform approach facilitates interaction, cooperation and value creation among different stakeholders (Eloranta and Turunen, 2016; Cenamor et al., 2017). Enabled by digital technologies, such as enterprise resource planning (ERP), big data analytics, cloud computing and the Internet of Things (IoT), platforms allow manufacturers to link IoT-enabled devices and products to collect and analyse operational and customer data in real time, which is essential for them in providing digital solutions and advanced services (Jovanovic et al., 2021; Tian et al., 2021a). These digital technologies also enable manufacturers to orchestrate their networks by facilitating cooperation with partners in an intelligent and value-adding manner (Cenamor et al., 2017; Coreynen et al., 2020). Moreover, platforms provide an infrastructure on which manufacturers can build close and long-term relationships with partners to structure, bundle and leverage their resources and capabilities and cocreate knowledge, which are critical for the success of servitization (Qi et al., 2020; Zhang et al., 2017).

The objective of this study is to empirically investigate the roles of platforms in a manufacturer’s servitization journey, aiming to answer two research questions. First, how does servitization evolve? Second, how do platforms affect the transition between the stages of servitization? We conduct a longitudinal case study of a Chinese manufacturer that has implemented servitization since 2011 and has used various digital technologies to offer solutions and develop platforms (Ferdows et al., 2021). This study thus answers the call for
more research on digital servitization in emerging economies (Gebauer et al., 2021; Jovanovic et al., 2021). Moreover, this work provides empirical evidence on the effects of platforms on servitization and the roles of network partners in the different stages of servitization, which extends the research scope involving servitization from that of a single-firm or dyadic relationship to that of a network (Paschou et al., 2020). The findings also enhance the current understanding of the roles of digital technologies in shaping the evolutionary path of manufacturers towards servitization stages and the interplay between servitization and platforms (Gebauer et al., 2021; Jovanovic et al., 2021). Furthermore, this study provides guidelines for manufacturers on how they can benefit from digital technologies to advance their servitization journey and avoid the servitization paradox (Tronvoll et al., 2020).

2. Literature review

2.1 Servitization

Literature reviews have been conducted to examine the servitization research from various perspectives. For example, Baines et al. (2009) focus on the definitions, evolution, features, drivers and challenges involved in the adoption of servitization, calling for more research on how manufacturers make the transition to servitization. Lightfoot et al. (2013) find that the servitization research focuses mainly on the concepts of product-service differentiation, competitive strategy, customer value, customer relationships and product-service configuration, suggesting the exploration of the links between servitization and integration with supply chain (SC) partners as a future research direction. Baines et al. (2017) identify the context, process and content of the transformation of servitization from an organizational change perspective and find that the processes of servitization remain underdeveloped and that there is a lack of understanding of advanced services. Brax and Visintin (2017) find three different approaches to represent servitization: 1) end-state models that focus on the end state and outcome of
servitization, 2) gradual transition models that take a process-oriented perspective and represent servitization along a continuum, and 3) stepwise progression models that identify progressive stages of increasing servitization or distinguish patterns with sequential steps or transformational tasks. They also identify eight levels of servitization (i.e., products with limited support, installed and supported products, complementary services, product-oriented solutions, systems leasing, operating services, managed service solutions, and total solutions).

Rabetino et al. (2018) analyse three servitization-related research communities (i.e., product-service systems, solution business, and service science) and call for more research addressing the servitization process and using longitudinal designs. Raddats et al. (2019) identify five main themes (i.e., service offerings; strategy and structure; motivations and performance; resources and capabilities; and service development, sales and delivery) in servitization research. They argue that exploring the servitization transition process at the network level for all actors and using a multi-actor perspective to investigate the impact of digital technologies on servitization should be research priorities. Paschou et al. (2020) find that existing studies on digital servitization focus mainly on the conceptualization of digital servitization; its benefits for customers, providers and other stakeholders; the core digital technologies adopted for servitization strategies; and the linkages among specific digital technologies and different service categories. They call for more research on digital servitization in developing economies and on how digital technologies affect the transition to further stages of servitization. Therefore, there is a lack of empirical evidence on the evolution of servitization and the roles of digital technologies in advancing servitization.

2.2 Static and dynamic perspectives of servitization

Scholars have used the static perspective to identify different forms of servitization. For example, Tukker (2004) argues that servitization can be positioned on a product-service continuum ranging from products with services as an add-on to services with tangible goods
as an add-on (i.e., product-oriented, use-oriented and result-oriented). Baines and Lightfoot (2014) propose that servitization can be classified according to the services offered (i.e., base, intermediate and advanced services). Frank et al. (2019) divide servitization (i.e., smoothing, adapting and substituting services) and digitalization (i.e., manual, digital and factory integration) into three levels respectively; they then use their configurations to describe the implementation of digital servitization. Kohtamäki et al. (2019) identify five digital servitization business models: that in which a product-oriented service provider provides products and add-on services, that in which an industrializer emphasizes product and service modularity to improve efficiency, that in which a customized integrated solution provider offers integrated product-service solutions, that in which a platform provider connects various providers and customers, and that in which an outcome provider sells outcomes instead of products or services.

Recently, researchers have taken a dynamic perspective to investigate the stages of servitization and the transition between the stages. For example, Coreynen et al. (2017) identify three servitization pathways: industrial servitization, which provides process support services and is based on back-end digitalization; commercial servitization, which provides process support services and is based on front-end digitalization; and value servitization, which provides process support services, process delegation services and hybrid solutions and is based on both front- and back-end digitalization. Palo et al. (2019) explicate the servitization process as a contestation of a firm's parallel business models (i.e., one existing and dominant, one emerging) and consider servitization as a bottom-up, emergent and iterative process of business model contestation. Moreover, Rajala et al. (2019) investigate the transition from offering integrated solutions to offering modular solutions using a longitudinal case study approach and find that such transition requires three capability development phases (i.e., solutions based on ad hoc integration, smart solutions based on modular design, and through-chain modularity).
Paiola and Gebauer (2020) define digital servitization strategies based on the access to end-user firms and the level of service orientation of the business model, finding that manufacturers move towards digital disintermediation and distribution control and towards process orientation and outcome orientation. Kamalaldin et al. (2020) identify three phases (i.e., fundamental, intermediate and advanced phases) of the digital servitization relationship and find that investment and engagement in this relationship grow as it evolves. Chen et al. (2021) conduct a longitudinal case study of a Chinese air conditioner manufacturer and conclude that its servitization journey includes three stages: 1) standard product service supported by an internal activity system, 2) customized solutions supported by a supply and distribution chain, and 3) smart solutions supported by an ecosystem. Moreover, some studies have investigated the organizational changes associated with the implementation of servitization. For example, Baines et al. (2020) find that the adoption of servitization requires manufacturers to undergo four stages of organizational maturity (i.e., exploration, engagement, expansion and exploitation). Tronvoll et al. (2020) argue that the adoption of digital servitization requires a firm and its network to transform from planning to discovery, from scarcity to abundance, and from hierarchy to partnership. Therefore, existing evidence reveals that the implementation of servitization evolves through different stages. However, there is limited empirical evidence on the drivers of the transition between stages and the roles played by digital technologies in the servitization journey.

2.3 Platform approach to servitization

Platforms are organizational and technological structures that enable the coordination of activities among different actors in a way that leverages value cocreation (Cenamor et al., 2017; Jovanovic et al., 2021). Thomas et al. (2014) argue that platforms can be defined at different levels, such as product systems, SCs, markets and industries; they can be positioned on a continuum from predominantly firm-internal platforms (e.g., product family platforms) to
increasingly complex firm-external platforms (e.g., platform ecosystems) (Thomas et al., 2014). Researchers argue that a manufacturer may develop its platform in different phases. For example, Tian et al. (2021a) find that a platform may develop in three stages (i.e., initiating, transitioning and strengthening), which require a leader to develop its targeting, legitimizing and envisioning, as well as expert building capabilities. Jovanovic et al. (2021) find that industrial digital platforms evolve through three phases (i.e., product platform, SC platform and platform ecosystem) in terms of platform architecture, governance and services.

Prior studies suggest that a platform approach facilitates manufacturers’ implementation of servitization. For example, Eloranta and Turunen (2016) find that platforms enable servitization by connecting actors to provide opportunities for collaboration, sharing proprietary resources that benefit individual actors in service innovation and provision, and integrating systems to form an efficient service delivery system. Cenamor et al. (2017) argue that a platform approach plays the roles of back-end unit orchestrator and front-end unit offering builder, which enable manufacturers to pursue both customization and operational efficiency when implementing advanced services. Tian et al. (2021b) find that the transition from nondigital through digital to smart servitization requires the support of an appropriate configuration of front-end (i.e., offline, online and connected) and back-end (i.e., analogue, digital and smart) platform approaches. Kapoor et al. (2021) analyse the servitization-based platform ecosystem from four perspectives (i.e., technical core, key actors, structural boundaries and task aspects). They find that servitizing manufacturers use modularity and standardization as the technical core and concurrently operate across multiple structural boundaries. Eloranta et al. (2021) propose that platforms enable servitizing manufacturers to manage relational and cognitive complexity through complexity reduction and absorption. Therefore, although researchers highlight that platforms play an important role in servitization (Tian et al., 2021b; Jovanovic et al., 2021), there is limited empirical evidence on the interplay
between platforms and servitization and how the platform approach enables the transition of servitization.

3. Methodology

We use a longitudinal case study approach. This method allows us to qualitatively capture the evolution of servitization over an extended time horizon (Weigel and Hadwich, 2018). It also allows us to focus on the uniqueness of the case to generate theoretical insights and ensures the depth of the case analysis with thick descriptions (Yin, 2009).

3.1 Case selection

Based on the principle of theoretical sampling, we select Haier Smart Home (i.e., Haier) as our sample case (Yin, 2009). Haier is in the home appliances industry and was ranked 448 on Fortune's Global 500 list in 2019, with a revenue of $27.7 billion. Haier topped the Global Major Appliances Brand Rankings by Euromonitor International for 12 consecutive years starting in 2009 and was included in the BrandZ™ Top 100 Most Valuable Global Brands in 2020 and 2021.

Haier started to implement servitization in 2011 and viewed servitization as a core business strategy to compete and gain competitive advantages. The company began to implement IoT-based smart home solutions in 2019 and launched the brand “Three-Winged Bird” in 2020. As highlighted by the Chairman of Haier, the platform is a “framework for the rapid organization of resources.” Haier has invested a great deal in developing digital platforms (i.e., COSMOplat) that enable it to reach its business partners and combine and reconfigure resources in the extended SCs to support its servitization operations (Ferdows et al., 2021). Hence, Haier provides a typical and exemplary case with which to explore the evolution of servitization and the interplay between platforms and servitization.

3.2 Data collection
We used semistructured interviews to collect data. We adopted a snowball sampling approach to select interviewees. First, we interviewed senior executives at Haier and then asked them to recommend department directors (i.e., middle managers in charge of a business division or microenterprise) to be interviewed. Then, the department directors were asked to recommend managers among Haier’s business partners.

Three rounds of data collection were conducted between 2014 and 2020. An interview protocol was developed to guide data collection and is provided in Appendix A. The first round of data collection was conducted between 2014 and 2016. We collected data related to Haier’s servitization operations, the challenges it faced in implementing servitization, and the roles of platforms in servitization. The second round of data collection was conducted between 2017 and 2019. We collected data related to the development of servitization, the challenges associated with its development, the development on the platform and how the platform affects servitization. In addition to Haier managers, the research team interviewed managers among Haier’s business partners. These interviews explored the topics related to milestones in collaboration with Haier, how platforms influence their collaboration with Haier and their roles in Haier's servitization operations. The third round of data collection took place in 2020. We collected data related to the recent development of Haier’s servitization and its platform.

We organized workshops in collaboration with Haier, in which managers of Haier and its business partners were invited to discuss topics related to servitization and the platform with the research team. This group discussion enabled us to elicit insights and details that could not be gleaned from individual interviews. In total, our empirical data were drawn from 50 semistructured interviews, which usually lasted approximately 1.5 to 3 hours, and 11 workshops. Appendix B provides a summary of the data collection processes. The use of diverse data sources enabled the verification and triangulation of our results (Yin, 2009).

3.3 Data analysis
We used a three-step process to code and analyse the data (Gioia et al., 2013).

**Step 1. Developing thick descriptions**

We first developed a narrative to describe Haier’s implementation of servitization and platforms. The descriptions were then reported back to key informants at Haier and its business partners to ensure the reliability and comprehensiveness of the research team’s understanding of how events unfolded over time (Langley, 1999).

**Step 2. Developing the data structure**

We began with a first-order analysis to identify the different stages of Haier’s servitization and platforms. The first-order analysis focused on labelling informant-centric terms and codes (Gioia et al., 2013). Then, we developed researcher-centric themes and codes to make theoretical interpretations of the first-order informant-centric concepts (Gioia et al., 2013). We conducted several iterations that involved comparing and matching concepts generated from the data and those provided in the literature on servitization and platforms. After this process, theoretically similar first-order concepts were grouped, and second-order themes emerged. Finally, the research team distilled the second-order themes into aggregate dimensions. Figure 1 presents the data structure.

---Insert Figure 1 about here---

**Step 3. Applying a “temporal bracketing strategy” to divide process data into phases**

After classifying all the case data into second-order themes, we constructed a temporal sequence that revealed a process pattern (Chen et al., 2021). We then used the temporal bracketing method to structure the process pattern by decomposing the time scale into successive periods to transform process data into a series of discrete but connected blocks (Langley, 1999). Accordingly, we divided Haier’s servitization journey into three distinct stages: stage 1 (2011-2016), stage 2 (2016-present), and stage 3 (2019-present).
4. Findings

4.1 Servitization

4.1.1 Stage 1: Product-oriented solution (2011-2016)

With the pressure from rising raw material prices and consumers' increasing requirements for services, in 2011, Haier made servitization a strategy for growth and focused on providing product-oriented solutions, including products and extended services associated with the products that are loosely combined. For instance, Haier offers product customization, membership, logistics and after-sale services and allows consumers to customize delivery times and locations. Haier also created an individualized profile for consumers, including the repair, maintenance, and cleaning records of their products. By paying an annual fee (398 RMB/year), members can enjoy value-added services (regular on-site household appliance cleaning and maintenance service, product lifecycle management services, etc.). Haier also allows consumers to personalize their products using an online tool (www.ehaier.com). Consumers can choose functions from a menu and upload an image to customize the exterior of the product to generate a customized product solution. Haier’s online store calculates the price of different module combinations for consumers and shows them 3D drawings, pictures, videos, and comments from other consumers, all of which enhance the value of the products for these consumers. Hence, Haier provides services directly to consumers, and the digital component is mainly embodied in the extended services.

The case evidence reveals that providing a product-oriented solution brings about three types of complexities associated with service provision. The first type is service quality control. As the vice president of Haier mentioned, “Ninety-four percent of consumers have had a bad experience when repairing home appliances. Consumers complain to us. We investigate dealers who should be held accountable. Dealers investigate the maintenance personnel.
“Everyone spends a lot of manpower and resources dealing with complaints.” Hence, uncertainties and inconsistencies in service quality hinder Haier's servitization operations. The second type is service capacity management. As the general manager of Haier global sourcing commented, “Even though we have 100,000 developers in our R&D department, our capacity is still limited in meeting all customized requirements.” Although customization services enhance Haier’s competitiveness, they also bring about great challenges to human resources management in the implementation process. The third type is service cost control. As the vice president of Haier noted, “The high cost of service makes it difficult to make a profit; then, the poor profit leads to low salary of service person, the low salary lead to labour shortage, and the labour shortage leads to high service cost… it seems to be a vicious circle.” Therefore, servitization increases operational costs, and how to reduce these costs while increasing service quality has become a key challenge for Haier.

4.1.2 Stage 2: Integrated solution (2016–present)

Haier has shifted from providing product-oriented solutions to integrated solutions since 2016. The integrated solution is characterized by the consumer utility or outcome that can be achieved by a bundle of physical products, services and information, seamlessly combined to provide more value than can the parts alone. For instance, Haier offers a food fresh-keeping solution to provide a healthy lifestyle by integrating intelligent refrigerators that can automatically manage temperature and humidity for different kinds of food, third-party software and other complementary services. As noted by the vice president of Haier, “Although the refrigerator of ten or twenty years ago can still be used today, in terms of nutrition and health services, such an old refrigerator is completely out of date. Consumers have recognized this point, and we can't fall behind.” Haier launched a heating and cooling solution by integrating intelligent air conditioners, proprietary technologies that could remove dust in time to prevent the breeding of bacteria inside the air conditioner, and third-party software supporting the user
interactive interface and the regulation of the air supply modes. Moreover, Haier launched a laundry cleaning solution by integrating intelligent washing machines that could accurately detect the local water quality and weight of clothes, customized detergents, and third-party services. Hence, Haier provides services to both consumers and business partners, and the digital component is mainly embodied in the connections between these products and services.

The case evidence reveals that providing an integrated solution brings about three types of complexities associated with SC management (SCM). The first type is integrating products and services. For instance, as a senior manager of Haier’s Intelligent Manufacturing Research Institute noted, “How to quickly identify the appropriate hardware, software, services, and systems in each solution redesign and re-engineering and develop the corresponding coordination to integrate them is extremely complex.” In addition, ensuring the consistency, timeliness and sustainability of the integrated solutions is challenging. As a senior manager of the intelligent SC commented, “Our home appliances should also be upgraded regularly. This requires us to ensure the stability and reliability of the supply of the various resources that make up the solution over the next few years.” The second type is SC coordination. To smoothly and efficiently integrate products and services, Haier interacted and negotiated with upstream and downstream partners about pricing, discounting, delivery, marketing and other factors, thus increasing the complexity of SCM, especially when involving third-party service providers. For example, as the director of the intelligent SC noted, “As the Internet era is more demanding for response speed than ever before, such a chain structure was inefficient because the upstream would always be slow to respond to the changes in demand from downstream. All information had to be conveyed via Haier.” The third type is building agile SCs. When developing and providing an integrated solution, the individualized needs of consumers are dynamic and very difficult to predict. Thus, providing integrated solutions requires Haier to build agile SCs. Haier needs to implement data-driven decision making and adopt advanced
information technologies. Haier must also adjust its business relationships with SC members “from those focused on long-term contracts to ones centred on short-term contracts and even event-driven management to enable rapid responses to diverse customer demands” (the director of the intelligent SC).

4.1.3 Stage 3: Smart connected solutions (2019-present)

Haier has offered smart connected solutions that combine multiple integrated solutions into an ecosystem to meet consumer demand since 2019. These multiple integrated solutions are connected by 5G and IoT technologies to realize smart utility according to consumers’ habits and scenarios. Haier officially launched the smart connected solutions brand “Three-Winged Bird” at the end of 2020. As the president of Haier commented, “We firmly believe that with the achievement of 5G and IoT technologies, a smart lifestyle will surely reach millions of households. Sometimes, the integrated solutions need to be broken up and reassembled according to up-to-date technology.” Hence, smart connected solutions link different integrated solutions and extend beyond bundles of products and services. Haier provides services mainly to its business partners, and the digital component is mainly embodied in the connections among multiple integrated solutions.

By connecting intelligent home appliances such as washing machines, drying racks, folding machines, smart wardrobes, and smart dressing mirrors through IoT technologies and by collaborating with garment manufacturers, clothing stores and users, Haier provides clothing lifecycle management solutions, including washing and maintenance, storage, fashion matching, purchasing and recycling solutions. A radio-frequency identification (RFID) chip can be implanted in a cloth washing label by garment manufacturers, and the washing scheme can therefore be automatically matched. Then, the washing machine and dryer can be connected to achieve “teamwork.” When a cotton shirt is being washed, at the end of the shirt washing process, the dryer automatically selects the drying process. Moreover, Haier has
developed intelligent cloakroom solutions and smart wardrobes. Consumers can link with the storage function of these pieces of smart furniture through a mobile app to manage the storage and search for clothes. Additionally, Haier has developed a smart dressing mirror. Consumers can try on and match virtual images, and the mirror can regularly recommend clothing matching schemes according to human body data and personalized clothing needs. Haier’s vice president highlighted the following regarding Hairer’s business partners being able to benefit from smart connected solutions: “We can provide different production schemes for manufacturers through the data of clothing usage scenarios and users’ dressing habits. Product inventory and sales data can be obtained in a timely manner; the data can enrich user portraits so that the retailers can provide more accurate services and improve the repurchase rate.”

By connecting intelligent home appliances, such as intelligent refrigerators, smart ovens, smart rice cookers and other kitchen appliances, and by collaborating with food suppliers, restaurants and chefs, and consumers, Haier provides a range of connected smart kitchen solutions. By the end of 2020, 718 cooperative enterprises collaborated to provide smart kitchen solutions. For instance, authentic roast Peking duck is usually available only at restaurants and is difficult to cook at home. To offer gourmet solutions that rival those of restaurants, Haier collaborates with restaurants, ingredient suppliers, cold chain providers, and blockchain technology providers to jointly provide the ability to make roast Peking duck at home. Similarly, by connecting humidifiers, air purifiers, air conditioners, aromatherapy machines, intelligent mattresses and other products, Haier provides smart air solutions. Haier can provide sleeping air solutions according to consumers’ personalized sleeping requirements and create a comfortable space that automatically monitors sleep health and actively adjusts smart products accordingly. Haier’s smart air solutions have also been used in other scenarios,
such as air quality and energy consumption management in office buildings and controlling air composition to protect archaeological discoveries.

The case evidence reveals that providing smart connected solutions brings about three types of complexities associated with ecosystem management. The first type is managing an extended service network. The service network of the integrated solution is dominated by Haier and its business partners in the home appliance industry. However, the service network of smart connected solutions requires not only the collaboration of business partners within the home appliance industry but also that of various smart hardware manufacturers from other industries as well as their SC partners. Complexity originates in various stakeholders and dynamic network relationships. For example, as the president of Haier’s COSMOplat mentioned, “The value proposition of many manufacturers’ solutions cannot keep up with our (Haier’s) service philosophy.” Manufacturers collaborating in the provision of smart connected solutions always seek Haier’s help in improving their SCM efficiency. However, they have very different requirements. As the head of one microenterprise serving the clothing industry stated, “for the same garment manufacturers, some hope to upgrade the hanging system, some hope to transform the production line and some hope that we can help enable interactive design and add 3D fitting services.” The second type is building self-driving SC networks. Haier expects the manufacturers involved in providing smart connected solutions to collaborate with Haier in a self-driving manner. How to motivate different stakeholders is an enormous challenge. As the president of Haier noted, “We hope the smart solutions we provide can be self-driven and self-iterative by all partners according to the changes in user needs. We expect our partners to have the same insight into user needs as we do, but that requires a lot of time and education costs.” The third type is implementing big data and advanced digital technologies. Haier’s managers mentioned that the issues of which digital technologies are adopted and how to connect hardware manufacturers and their business partners (software developers, sensors
developers, data storage service providers, etc.) in different industries create complexity. In addition, complexity emerges when performing digital technology- and data-based control, monitoring, optimization, and autonomy involving various stakeholders from different industries. Hairer’s servitization journey is illustrated in Table 1.

4.2 Platforms

4.2.1 Service platforms

Haier has successively developed digital platforms in different departments to promote servitization since 2011. The first department to “test the water” was Haier’s R&D department, which was transformed into a technology-exchange platform. Subsequently, other departments, such as logistics and procurement, were also platformized.

Service platforms connect Haier’s functional departments with third-party service providers and consumers. For instance, the company’s technology-exchange platform has attracted 100,000+ third-party technical experts and 8,000+ global innovators. As the vice president of Haier noted, “Through this technology-exchange platform, we can solve R&D problems via crowd innovation and crowdsourcing. For instance, we had a technical bottleneck with breast milk refrigeration. We posted this on the platform. An expert from a research institute of Yili group (a dairy producer) quickly offered a solution.” The interactive design platform has attracted 2,000+ third-party solution designers. Users of this platform can join different groups, such as those related to washing, air, and life and can initiate or take part in discussions on home appliances, rate and comment on the proposals developed by the design team, and even pre-order products.

We find that service platforms improve the visibility, transparency and efficiency of service processes by providing information systems (e.g., ERP and office automation (OA)) to
digitalize purchasing, warehouse and order management. For instance, Haier’s logistics platform has attracted 100,000+ third-party drivers, logistics property developers, and last-mile service providers. As the vice president of Haier noted, “The logistics platform connects third-party logistics companies, individual drivers, and truck owners to our warehouses and consumers through information systems.” The delivery task can be managed in real time by GPS positioning, order management, and automatic processing systems. The service processes on the installation site are recorded in detail through the mobile app. The delivery and installation commission is paid to service providers in real time through the settlement system. Therefore, the digital technologies embedded in service platforms facilitate the effective management of cross-functional operational activities.

We also find that these service platforms facilitate resource sharing among internal and external stakeholders to achieve economies of scale and scope of resource usage. By aggregating individual service capabilities, the scope of services can be expanded from serving several consumers to serving an entire community. The capacity and scalability of services can also be enhanced. Moreover, by standardizing and modularizing service processes in the back end, Haier can reuse and share resources, which increases the efficiency of its service delivery. As the vice president of Haier noted, “Through the platform, we were able to define the service roles of all personnel participating on it, ranging from delivery assistant, distribution and installation technician, and package service specialist to community service steward who contracts community services. We were also able to define the categories of services, from distribution to installation and to cleaning and maintenance of different types of home appliances, as well as home appliance recycling services.” Its platform thus enables Haier to reconfigure resources and service processes to fulfil consumer demands at high speed and low cost.

4.2.2 SC platform
At the end of 2016, Haier integrated different service platforms to develop an SC platform (i.e., COSMOplat) to support the development and delivery of integrated solutions. COSMOplat has a network structure and links all SC processes. In this way, Haier’s SC partners (e.g., wholesalers, retailers, product designers and suppliers), third-party service providers, and consumers are connected. This SC platform thus enables business partners to interactively participate in developing and delivering integrated solutions. Moreover, consumers can provide feedback on Haier’s products and services and participate in product design by offering suggestions for new products and services via the user interaction design platform. Haier sources technical expertise through the technology-exchange platform. For example, Haier found that a film used in papermaking developed by the China Paper Research Institute could be used in a refrigerator to control dryness. Haier also applied a technique used in the fuel cell industry to control the proportion of oxygen in the refrigerator. Through the purchasing platform, any registered supplier (including hardware component suppliers, software developers and other content suppliers) can submit their solutions. A virtual/real product prototype is developed, incorporating solution features, functionality, and price range. Haier promotes these solutions through various e-commerce channels and plans supply and delivery through the intelligent manufacturing platform and the sales platform. After-sales services are carried out by the lifecycle service platform.

COSMOplat is also designed to coordinate production planning and to manage inventories, payments and other routine transactions in Haier’s SC. A business intelligence system is embedded in COSMOplat to integrate and manage different information systems. In addition, by using IntelliSense technologies (VR, face recognition, etc.) and intelligent decision-making and optimization technologies (deep learning, AI, etc.), Haier can collect and analyse product usage and consumer behaviour data for demand forecasting and codesign with consumers, facilitating the development and delivery of the integrated solution. As the president of
COSMOplat stated, “The test we face is how competitive is the whole SC system? The efficiency of the system, the experience it provides to consumers, the structure of the solution, the speed of response, the ability to anticipate... Through COSMOplat, we can manage the SC in a fully interactive, efficient, and transparent manner.” COSMOplat thus enables Haier to have the end-to-end visibility of the SC and automate SC transactions, thus reducing transaction costs and improving responsiveness.

We find that the SC platform facilitates resource sharing across previous independent service platforms. For instance, suppliers of the purchasing platform can consult with the interactive design platform to learn consumers’ needs, and third-party designers of the interactive design platform are encouraged to confer with the technology-exchange platform to communicate with technical experts to solve problems and innovate. Thus, different business partners can join forces to form integrated solutions that can deliver greater value to consumers. COSMOplat has also established processes and rules to protect intellectual property, encouraging internal and external stakeholders to share resources and codevelop integrated solutions.

4.2.3 Platform ecosystem

Haier further developed COSMOplat into a cross-industry platform ecosystem in 2019. Haier developed 20 industry-specific SC platforms (e.g., those for clothing, agriculture, and mobile home industries) that were integrated into COSMOplat by 2020; hence, all of them have a common platform architecture, technology base and governance mechanism. The platform ecosystem enables Haier to link its business partners both with the SC and across different industries. As the chief operating officer of COSMOplat commented, “COSMOplat, at the beginning of its establishment, was, to a certain extent, a bonsai that needed to be copied and spread to form a forest. The ‘forest’ is what we wanted to develop.” The platform ecosystem connects SC partners, third-party service providers, IoT-based equipment, smart products, and
consumers across different industries while also enabling direct links among SC partners, third-party service providers and consumers. The platform ecosystem allows Haier to integrate and coordinate operations and processes (R&D, sourcing, production, distribution, logistics, customer service, etc.) to improve transparency and match the supply with the demand of multitier SCs. COSMOplat thus helps Haier commercialize its resources and capabilities to provide business-to-business (B2B) services to business partners collaborating in the provision of smart connected solutions.

The platform ecosystem uses platform architecture technologies to facilitate cross-industry interaction and provide technology toolkits for internal and external stakeholders. For instance, COSMOplat provides a common system for collaboration between business partners in various industries, promotes the centralized procurement of raw materials and logistics integration and helps business partners expand their services to different industries and markets. Furthermore, according to the chief technology officer of COSMOplat, COSMOplat has adopted cloud computing (e.g., software as a service), big data analytics and IoT to offer software-based resource packages that can be easily used by Haier’s business partners. These digital technologies enable Haier and its business partners to quickly and effectively cocreate smart connected solutions.

The platform ecosystem provides infrastructure and mechanisms for business partners to continually expand and strengthen collaborations. For example, Haier’s business partners can easily obtain knowledge and information from upstream and downstream of their SC and other industries. Such resource sharing can not only help these business partners establish new network relationships and obtain resources for innovation but also enhance their long-term engagement in the ecosystem. For instance, COSMOplat has supported a logistics service provider in extending its business by offering packaging and testing for new product launches and a supplier in choosing a location for building a new facility. Thus, the platform ecosystem
enables Haier to build dynamic SCs by reconfiguring structures and business partners quickly and efficiently. For example, COSMOplat enabled textile manufacturers to quickly shift their production to personal protective equipment in response to the COVID-19 pandemic. Moreover, the platform helped Haier reconfigure its SCs to design and produce innovative solutions. With the collaboration of business partners from multiple industries, an “intelligent temperature measurement and disinfection channel” was jointly developed within 3 days, and a “mobile isolation ward” was developed within 16 days. Hence, the platform ecosystem enables Haier to quickly adjust its SCs and resources to respond to rapidly changing environments. The structure of this platform is illustrated in Table 2.

5. Discussion and conclusions

5.1 Evolution of servitization

We find that Haier’s servitization journey includes three stages: product-oriented solution, integrated solution and smart connected solutions. Although Haier currently offers both integrated and smart connected solutions, it is shifting its focus to smart connected solutions and believes that they can bring about competitive advantages. As the latest development in terms of servitization, smart connected solutions cannot be understood using frameworks of the product-service continuum (Tukker, 2004) and service offered (Baines and Lightfoot, 2014) because they cannot be achieved by moving to the service end of the continuum or offering advanced services to consumers. Smart connected solutions can be viewed as comprising an ecosystem that aims to fulfil consumer demand in greater depth and breadth. Consumers obtain additional value from the connectivity and synergy of a wide range of products, digital technologies, and services.
Although studies have explored the dimensions that distinguish the stages of servitization (e.g., Brax and Visintin, 2017; Kohtamäki et al. 2019), most have focused on the nature of the offering, the proportion of services in the solution, and types of outcomes. Haier’s servitization journey shows that the recent development of servitization can be understood based on the target of the service and the digital components embodied in the solution, which reflect how servitization evolves by leveraging network approaches and digital technologies to extend the boundaries of servitization.

The case evidence shows that as servitization evolves, the targets served directly by Haier are changing. In stage 1, Haier provides services mainly to consumers. In stage 2, Haier provides services to both consumers and business partners. Haier provides B2B services to its partners to overcome the obstacles they face by finding, for example, additional sources of raw materials, production capacity, transport and logistics services, or financial support. These services aim to improve the efficiency of the SC to support the provision of integrated solutions. Business partners play a supportive role in servitization operations. In stage 3, Haier provides services mainly to business partners who then provide services to consumers. Haier recognizes that providing smart connected solutions requires expertise and resources located beyond its boundaries, its dominant SC, and even the home appliance industry. Therefore, Haier has invested many resources and effort in designing and delivering B2B services to business partners to improve their capabilities and capacities for jointly developing and providing smart connected solutions. The changes in Haier's service targets reflect the dynamics of the network, resources and capabilities involved in the three stages of servitization (Weigel and Hadwich, 2018; Kohtamäki et al., 2019; Kapoor et al., 2021). Therefore, a manufacturer can advance its servitization by expanding its service targets from consumers to SC partners (Lightfoot et al., 2013) and ecosystem participants (Kapoor et al., 2021).
Our case study shows that as servitization evolves, digital components play an increasingly important role in the solution. The digital components embedded in a solution reflect its smartness and connectivity. The digital component is mainly embodied in the extended services in stage 1 and the products and connections between products and services in stage 2. The digital component has become the core of the solutions in stage 3. The literature on digital servitization has revealed that the impacts of digitalization on servitization can range from incremental changes (e.g., efficiency and transparency enhancement through software and information systems) to radical innovations (e.g., business model innovations through 3D printing, IoT, and digital twins) (Visnjic et al., 2018; Kohtamäki et al., 2019). Therefore, a manufacturer can advance its servitization by integrating more digital technologies into its solutions. Thus, we propose the following:

**P1. Servitization can be divided into three stages (i.e., product-oriented solution, integrated solution, and smart connected solutions) according to the target of services and the digital components embodied in the solution.**

**5.2 Interplay between servitization and the platform**

The case evidence shows that Haier uses a platform approach to support the implementation of servitization. Its platform also evolves through three phases: the service platforms, SC platform and platform ecosystem. The service platforms link Haier’s functional departments with third-party service providers. The SC platform links various service platforms. The platform ecosystem links SC platforms in various industries. Therefore, Haier’s platforms have been expanding their boundaries from functional departments to SCs and then to SCs in various industries along with the evolution of servitization. We find that platforms not only support the implementation of servitization by addressing the complexities associated with it but also enable its evolution (Figure 2).
Offering product-oriented solutions leads to complexities in service quality control, service capacity management, and service cost control. Haier developed service platforms for functional departments to address these complexities. By connecting third-party service providers and consumers, Haier expanded its capacity and capabilities in providing services to consumers, which can reduce the costs and improve the speed of service delivery. Thus, the service platform helps Haier address complexities in service capacity management and service cost control. Through developing information systems that improve the efficiency of transactions between functional departments and third-party service providers, the service platform helps Haier address the complexity in service quality management. Through leveraging resources from third-party service providers, Haier’s functional departments can quickly and effectively address the complexities in service cost control and service capacity management.

Offering integrated solutions leads to complexities in terms of integrating products and services, coordinating SCs, and building agile SCs. Haier integrated its service platforms into an SC platform to address these complexities. SC platform enables Haier to establish connectivity between SC partners, third-party service providers, and consumers, which simplifies the integration between products and services. The SC platform also enables Haier and its business partners to access each other’s resources and Haier to integrate different information systems at the SC level. Thus, Haier can adjust and reconfigure integrated solutions quickly and efficiently throughout the solution’s lifecycle according to changes in consumer demands. The SC platform also facilitates direct interactions between Haier and SC partners, and hence, the SC can collaborate on inventory management, demand forecasting, production planning, delivery scheduling and making operational and tactical decisions, thus facilitating SC coordination. The SC platform also helps Haier’s business partners expand their footprint.
and Haier cultivate closer and smoother relationships with them, which are critical for building agile SCs. The digital infrastructure of the SC platform allows for real-time information sharing and joint decision making in SCs, which make Haier responsive to environmental uncertainties by enhancing SC visibility and transparency.

Offering smart connected solutions leads to complexities in managing extended service networks, building self-driving SC networks, and implementing big data and advanced digital technologies. Haier integrated SC platforms in different industries to build a cross-industry platform ecosystem. The platform ecosystem is based on digital technologies such as cloud computing, big data analytics and IoT, which enable Haier to improve its capabilities in monitoring and controlling its business partners and identifying and absorbing their valuable resources, skills, and knowledge, which help the company manage its extended service networks. Thus, Haier can efficiently collaborate and coordinate with multitier, cross-industry business partners to cocreate smart connected solutions. The platform ecosystem connects SC partners, third-party service providers, IoT-based equipment, smart products, and consumers in different industries, which helps Haier’s business partners identify new opportunities to expand their business. The platform ecosystem also provides mechanisms and a decentralized structure to encourage Haier’s business partners to collaborate and integrate resources to innovate and respond to markets quickly. Thus, it helps Haier build self-driving SC networks. The platform ecosystem offers application technologies in the form of platform as a service and SC as a service, which provide a cost-effective way for Haier’s business partners to access big data and advanced digital technologies. Therefore, we propose the following:

\textit{P2. Platforms support a manufacturer in implementing servitization by addressing the complexities associated with servitization.}

\textit{P2a. The service platforms support a manufacturer in offering product-oriented solutions by addressing the complexities associated with service provision.}
P2b. The SC platform supports a manufacturer in offering integrated solutions by addressing the complexities associated with SCM.

P2c. The platform ecosystem supports a manufacturer in offering smart connected solutions by addressing the complexities associated with ecosystem management.

The case evidence shows that the service platforms enable Haier to transform its offerings from product-oriented solutions to integrated solutions. Specifically, first, the service platforms enable Haier to extend its service targets. The service platforms facilitate Haier to accumulate technical skills and management capabilities for adopting the platform approach and help Haier to understand the business models of partners participating in the SC platforms. This understanding of partners’ business models lays the foundation for Haier to identify the value that Haier can offer these partners in stage 2, when Haier changes the service target from consumers to both consumers and business partners. Second, the service platforms also enable Haier to put more effort into connecting resources by digital components. The service platforms help Haier develop a network of third-party service providers and procedures and practices for resource sharing and integration (Eloranta and Turunen, 2016). The rich technologies, knowledge, hardware, software, and services accumulated by these platforms have prompted Haier to think about how to connect them. For example, Haier developed a smart refrigerator, which laid the foundation for a solution to keeping food fresh and was developed based on the advanced technologies accumulated by the technology-exchange platform and knowledge about consumer demand collected by the interactive design platform. When Haier wanted to offer integrated solutions, service platforms became critical enablers.

The case evidence shows that the SC platform enables Haier to transform its offerings from integrated solutions to smart connected solutions. Specifically, first, the SC platform enables Haier to extend its service targets further. The SC platform allows Haier to accumulate abilities in SCM, information processing, customization, etc., and to develop a network of capable and
trustworthy business partners and build close relationships with them. Moreover, the SC platform helps Haier’s partners gain experiences and skills for cocreating products and services. In this way, the SC platform expands the scope of the responsibility of Haier and facilitates Haier to commercialize its services for business partners, in order to provide more professional services and higher added values to these partners to enhance their engagement (Jovanovic et al., 2021). Second, the SC platform also enable Haier to connect multiple integrated solutions by digital components. The architecture and the governance mechanism of the SC platform have been viewed as a template that has been replicated in different industries (Kapoor et al., 2021). Thus, the SC platform laid a foundation for cross-industry resource connection and the development of the smart connected solutions.

In addition, both the service platforms and the SC platform support Haier in successfully implementing servitization. The positive feedback received motivates Haier and its business partners to invest resources to push the boundaries of its servitization operations (Luoto et al., 2017). Therefore, we propose the following:

P3. Platforms enable a manufacturer to advance servitization.

P3a. The service platforms enable a manufacturer to offer integrated solutions.

P3b. The SC platform enables a manufacturer to offer smart connected solutions.

5.3 Theoretical contributions

This study contributes to the servitization literature in two ways. First, it provides empirical evidence that a manufacturer’s servitization journey includes three stages and that it can advance servitization by changing the target of the service from consumers to business partners and improving the digital components embodied in the solution. We also reveal that implementing servitization may enhance complexities in service provision, SCM and ecosystem management. The results thus enhance the current understanding of the stages of
servitization (Palo et al., 2019; Kamalaldin et al., 2020; Chen et al., 2021). We find that Haier has transformed from product-oriented solutions to integrated solutions but, at the same time, offers integrated and smart connected solutions, which suggests that we should combine gradual transition and stepwise progression models in understanding the stages of servitization (Brax and Visintin, 2017). This study also answers scholars’ calls for more research on the impacts of network and digital technologies on the servitization transition process (e.g., Raddats et al., 2019; Weigel and Hadwich, 2018; Kapoor et al., 2021). The findings improve existing knowledge on the process of servitization and how a manufacturer can offer advanced services (Baines et al., 2017; Rabetino et al., 2018).

Second, this study provides empirical evidence on the interplay between platforms and servitization and how the platform approach enables the transition of servitization (Tian et al., 2021b; Baines et al., 2009). Although studies have argued that platforms play significant roles in servitization (Cenamor et al., 2017; Eloranta et al., 2021), scholars’ understanding of how platforms affect servitization is still fragmented (Eloranta and Turunen, 2016). We find that a platform needs to co-evolve with servitization by expanding its boundaries. Moreover, platforms not only support the implementation of servitization by addressing complexities but also enable the transition to the next stages of servitization. This study also answers the calls for empirically exploring the links between servitization and integration with SC partners (Lightfoot et al., 2013). The results shed light on how digital technologies affect the transition to further stages of servitization (Raddats et al., 2019, Paschou et al., 2020). The findings thus provide insights into the mechanisms through which platforms drive the transition of servitization, which deepens the current understanding of the servitization transition process at the network level (Raddats et al., 2019).

5.4 Practical implications
This study also provides guidelines for managers on how to advance their servitization and use a platform approach to support their servitization journey. First, we suggest that a manufacturer implement servitization by providing consumers with product-oriented solutions that include loosely coupled products and extended services associated with these products, integrated solutions that include a bundle of seamlessly combined products and services, or smart connected solutions that include multiple integrated solutions. Managers should be aware that advancing their servitization journey requires them to transform the targets of their services from consumers to consumers and business partners and then to business partners, and extend the digital component embodied in the solutions from extended services to the connection of products and services and then to the connections of multiple integrated solutions. Managers should be warned that implementing servitization may increase complexities in their service provision, SCM and ecosystem management.

Second, we suggest that managers use a platform approach to implement servitization. Platforms should co-evolve with servitization. We suggest that a manufacturer build service platforms that connect functional departments with third-party service providers and consumers to support the delivery of product-oriented solutions. Such a manufacturer would need to build an SC platform that integrates different service platforms and connects SC partners, third-party service providers and consumers to support the delivery of integrated solutions. This manufacturer would also need to build a platform ecosystem that integrates industry-specific SC platforms and connects SC partners and third-party service providers in different industries and with consumers for the purpose of supporting the delivery of smart connected solutions. Managers should also be aware that service platforms enable them to offer integrated solutions and that the SC platform enables them to offer smart connected solutions.

5.5 Limitations and directions for future research
This study has three main limitations. First, we conducted a longitudinal case study of a Chinese manufacturer. Future studies could generalize and validate the findings in other contexts. Confirmatory case studies and surveys could be conducted to test the results. Second, we focused on the impacts of platforms on servitization. The implementation of servitization could also be driven by the business and institutional environments, such as competitors’ strategy, government policies and competition intensity. Future studies could investigate how environmental contexts influence the implementation and transition of servitization. Third, this study did not explicitly investigate the impacts of servitization on firms’ operational and financial performance. Future studies could examine how different stages of servitization affect performance outcomes.

References


