VALUE CO-CREATION PRACTICES IN VALUE PLATFORMS: THE CASE OF THE TEXTILE SECTOR IN CHINA

Abstract :

Industry 4.0 and the IIoT (Industry Internet of Things) are prevailing trends that influence nearly all industries, including the 'low-tech' textile industry. The purpose of this article is to explore what co-creation practices manufacturers can use to exploit the opportunity of platforms in an Industry 4.0/ IIoT context. It also intends to identify the trajectories of changes in companies' platform strategies. Building on a platform typology, we describe platforms as IIOT-enabled environments containing dynamic relations of technologies, interactions, processes and humans, which act as a foundation where platform providers stimulate value co-creation with their network of complementors and gain competitive advantages by orchestrating resources and leveraging network effects. Using an interpretive methodology, we observe four cases of Chinese textile manufacturers transforming to a platform-based business model, thereby upgrading value co-creation. Based on the cross-case analysis, the start point and three distinct transition routes are identified: 1) Starting from offering standard products; 2) plus customer-centric offerings; 3) plus value-adding service; and 4) plus integrated personalized solutions. This study contributes to the IMP (Industrial Marketing and Purchasing) Group's research by linking the recent focus of the network literature, the value co-creation view, and the recent strategic management insights on network management to the recent value platform context. We highlight how platform leverage logics can be used to enhance value co-creation through upgraded business models.

Key words: Value co-creation practice, Value platform, Platform leverage logic

1 Introduction

Increasingly, the competitive advantage of firms stems from managing relationships and resources in today's digital, interconnected and networked environments (Forkmann, Henneberg, and Mitrega, 2018, pp.4-26). In terms of value co-creation, technology platforms are considered increasingly significant among network-oriented collaborative forms (Möller and Halinen, 2017, pp.5-22). Firms that leverage the power of platform business models have grown dramatically in size and scale over the past decade (Evans and Gawer, 2016, pp.1-29). Platform firms such as Alibaba, Uber, and Google have made the drastic rise to growth and become one of the most valued companies. At the same time, many long-lived companies are considering how they can adopt platform thinking to redefine the dynamics of competition within and across sectors and sustain their advantages (Constantinides, Henfridsson, and Parker, 2018, pp.381-400). For instance, Siemens has put great efforts in the development of the MindSphere platform to harness the wealth of data generated by the IIoT.

There have been special interests in the practices and mechanisms of value co-creation in the B2B system (Jaakkola and Hakanen, 2013, pp.47-58; Kohtamäki and Rajala, 2016, pp.4-13; Marcos-Cuevas et al., 2016, pp.97-107). In the age of Industry 4.0 and the Industrial Internet of Things (IIoT), digitalization is transforming the practices of value co-creation and value innovation related to platforms (Matthyssens, 2019). Therefore, it's extremely timely to study the value co-creation practices in platforms within an Industry 4.0 / IIoT context.

The paper builds upon a review of key references on (i) the resource-based view (Alvarez and Barney, 2017, pp. 87-105) and dynamic capability theory (Teece, 2018a, pp. 40-49), (ii) the theory and practice of value co-creation (Kohtamäki and Rajala, 2016, pp. 4-13), and (iii) the industrial network / markets-as-networks theory (Möller and Halinen, 2017, pp. 5-22; Aarikka-Stenroos and Ritala, 2017, pp. 23-36; Sousa, 2010, pp. 405-545). In combination with recent articles on platform orchestration and platform strategy / development (Thomas, Autio and Gann, 2014, pp. 198-219; Eloranta and Turunen, 2016, pp. 178-186; Perks et al, 2017, pp. 106-121), this review leads into a typology of platforms and of platform leverage logics.

Confronted with the present challenges of Industry 4.0 / IIoT, manufacturers are forced to transform themselves from traditionally a relatively independent part in the value chain to an interactive actor in an integrated network enabled by platforms. According to the article by Strozzi et al., (2017, p. 6579), 'China is leading the development of the enabling technologies of the Smart Factory, with more than 2500 patent registrations, compared to 1065 registrations in the USA and 441 in Germany'. We look behind the co-creation of the Chinese textile industry to uncover how Chinese textile manufacturers developed their platform strategies and what value co-creation practices they applied. We also intend to identify the trajectory of companies' platform strategy changes in the platform-based business models.

This research focuses on exploring the value co-creation practices enabled by platforms in the IIoT context. The article contributes to the network research and the industrial marketing literature by exploring (i) how companies co-create value through Industry 4.0/ IIoT platforms, and (ii) how do companies evolve to reach the potential set of platform-based business models.

To address the research issues, the study is constructed as follows. First, we present an overview of the value platform and leverage logics. Next, we look into the theory and practice of value co-creation. Thereafter, a preliminary 'value co-creation – platform leverage' framework is generated. In the main section, we use the framework as a lens to observe manufacturers' platform-based business models in the context of Industry 4.0/ IIoT. We present four cases of Chinese pioneer textile manufacturers that gradually developed the platform-based business. An interpretive methodology is adopted in theorizing over the relatively unstructured and dynamic issues. Based on the cross-case analysis, the start point and three distinct transition routes are identified. Lastly, we conclude with implications for theory and practice.

2 Theoretical development

2.1 Value platform and leverage logics

Platforms are defined in numerous ways according to the context in which the term is used. For instance, research from Thomas, Autio and Gann (2014, pp. 198-219) identifies four distinct streams of the platform literature from the context perspective, including organizational platforms, product family platforms, market intermediary platforms, and platform ecosystems. This study conceptualizes a platform as an approach to value co-creation originating in technological advancement subsequently affecting entire industries. Thus, our interest lies in the processes through which value is co-created and spread to industrial contexts. Therefore, platforms are understood here as IIOT-enabled environments containing dynamic relations of technologies, interactions, processes and humans, which act as a foundation where platform providers stimulate value co-creation with their network of complementors and gain competitive advantages by

orchestrating resources and leveraging network effects, labeled as 'value platform' (Perks et al, 2017, pp. 106-121; Ramaswamy and Ozcan, 2018, pp. 196-205).

In the literature, there is a wide variety of platform categorizations. First, a particularly popular categorization is based on a company's operating model, i.e., the use of platforms to organize productive or marketing resources. For instance, de Reuver, Sørensen and Basole (2018, p.125) refer to two basic types of 'non-digital' platforms where platforms merely mediate between different groups of users but offer no extensible service: productional platform (e.g., internal platform, supply chain platform, and industry platform) and transactional platform (e.g., two-sided platform and multi-sided platform). A second popular categorization is based on a technology-oriented focus, i.e., the use of digital technologies to transform the firm-level operation process and the industries. For instance, de Reuver et al., (2018, p. 126) emphasize the digital platform by defining it as technical artifacts containing innovation dynamics. Such a digital platform provides a technological foundation for participants to add innovations and increase the value of the whole system (Teece, 2018b, p.1376). According to the degree of digital innovation, the digital platform can be divided into different levels (e.g., the low-level pure-technical platform and high-level IoT platform) (de Reuver et al., 2018, pp. 129-130). Manufacturers can use a set of integrated strategies based on the platform ecosystem, containing both the mediating platform designed to organize the operating resources, and the digital platform focusing on technological innovations, to improve their own business process (Jacobides, Cennamo, and Gawer, 2018, pp.2255-2276).

Platforms fundamentally create value by coordinating two (or more) categories of actors who would not have been able to connect or transact without the platform (Gawer, 2014, pp.1239-1249). The value captured by actors increases as the number of participants in each category grows, which is known as "network effects" (Van Alstyne, Parker, and Choudary, 2016, pp.54-62.). Network effects are prevalent and typical in platforms, triggering a self-reinforcing cycle of innovation and growth (Evans and Gawer, 2016, pp.1-29). Powerful and superior network effects can under certain conditions bring great advantages in platform competition (Gawer, 2014, pp.1239-1249). Literature has pointed out that a firm can achieve strong and positive network effects by leveraging shared resources in platforms (Thomas et al., 2014, pp. 198-219).

Platform leverage refers to the logic of engaging network actors to combine and integrate resources in such a way that value co-creation and network effects are enhanced without a corresponding increase in the consumption of resources (Storbacka et al, 2016, pp. 3008-3017). Thomas, et al. (2014, pp. 198-219) suggest three types of architectural leverage logic in platforms: production, transaction and innovation leverage. Building on the radical and incremental nature of technological innovations (Dewar and Dutton, 1986, pp.1422-1433), this study extends the architectural leverage logic (Thomas, et al., 2014, pp. 198-219) into two dimensions (i.e., the incremental & radical innovation, and the transaction & production leverage), resulting in four categories: transaction-incremental (TI), transaction-radical (TR), production-incremental (PI), and production-radical (PR) innovations. Fig. 1 specifies each logic by giving the key characteristics and examples.

First, the TI logic puts an emphasis on optimizing marketing solutions by utilizing incremental innovation arrangements to the front-end process. Based on the article (Zomerdijk and de Vries, 2007, pp.108-131) the front-end process optimization is related to 'reducing the ratio of high-contact to low-contact work' for streamlining front-end interactions, and 'workflow coordination' for enhancing the speed and quality of a customer-centric process. The TI logic is similar to the idea of applying low-level IT-enabled functions rather than high-level collaborative innovations for

facilitating service operations (Chi, et al., 2018, pp.273-283). For instance, with the help of a platform, a focal company and its partners share information and coordinate business activities more efficiently and effectively. Another example is the online B2B auction platform that uses a platform approach to allow more efficiency and effectiveness in the procurement process.

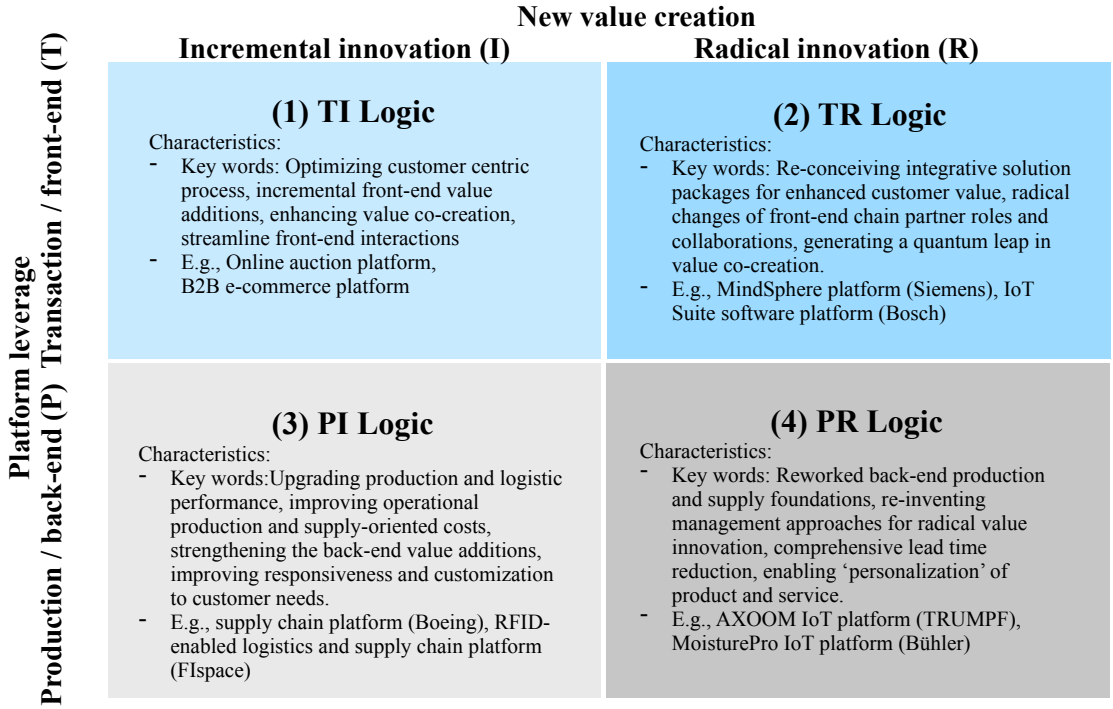

Figure 1. The platform leverage logic framework
Built on Thomas et al., 2014, pp. 198-219;
Dewar and Dutton, 1986, pp.1422-1433; de Reuver , et al., 2018, pp.124-135.

Second, the TR logic focuses on accelerating the solution optimization process by utilizing digital innovation arrangements that destruct existing value chains and business models. The digitally enabled platform approach facilitates the implementation of advanced service offerings and reconstructs the role of front-end units as solution builders. Siemens breaks down its offerings into services related to IoT, for instance, building the MindSphere platform to deliver Industry 4.0 solutions for manufacturers. MindSphere is a cloud-based IoT operating system that assists manufacturers to connect their products, plants, systems, and machines, enabling them to harness the wealth of data generated by the IoT with advanced analytics. In addition, Bosch established an IoT Suite software platform for IoT developers, aiming to provide connected solutions to the industry of manufacturing, mobility, energy and smart home. The IoT platform serves as the technical foundation on which Bosch provides a broad range of solutions consisting of hardware (e.g., sensors and industrial gateways), software, and services to customers.

Third, the PI logic aims at upgrading production and logistic performance by sharing and exploiting production resources in the back-end process. Based on the servitization literature (Coreynen, Matthyssens, and Van Bockhaven, 2017, pp.42-53) the back-end process is related to issues linked to the efficient development and deployment of solutions, such as improving operational production and supply-oriented costs. According to Cenamor, Sjödin and Parida, (2017, p.59) the back-end unit 'assumes the role of platform orchestrators'. From this perspective, the PI logic emphasizes the use of platforms in strengthening the back-end value additions, and improving responsiveness and customization to customer needs. For instance, RFID-enabled logistics and supply chain platform help to achieve real-time tracking in the warehouse or in the global supply chains. FIspace is an example using RFID-enabled supply chain platform in the food industry. Moreover, Boeing's IT-

based collaborative design platform reflects the PI logic. In fact, Boeing develops a collaborative design platform where the company owns many of the design diagnostic and testing tools used by the network partners in the development of 787 (Nambisan and Sawhney, 2011, pp.40-57).

Last, the PR logic refers to establishing a networked production foundation upon which firms working collaboratively in earlier distributed manufacturing systems. According to early research (Chandy and Tellis, 1998, pp.474-487; Gallouj and Weinstein, 1997, pp.537-556), radical innovations involve substantially new technology and substantial changes in existing offerings. In PR logic, the platform approach allows back-end units to re-inventing management approaches for radical value innovation, comprehensively reducing lead time, and enhance adaptability towards customers' specific needs (e.g., personalization of product and service). For instance, a German machine tool manufacturer TRUMPF founded AXOOM as a smart manufacturing platform for Industry 4.0. The AXOOM platform connects manufacturers, machines, sensors and software, and enables cloud-based data storage and analysis. Moreover, IoT and digitalization have brought values to the food and feed industry. For instance, Bühler launched MoisturePro, a cloud-based digital service that uses Microsoft's Azure IoT cloud platform technologies to build an intelligent drying solution with real-time, continuous moisture management. The use of digital technologies has driven huge improvements in quality and efficiency.

Here, we suggest the platform leverage logic as a theoretical lens for manufacturers to better achieve leveraged benefits in the field of production, transaction and technological innovation in value platforms.

2.2 Theory and practice of value co-creation

Prior studies have emphasized the theory of value platforms and platform leverage logics, but give only limited guidance on how companies achieve the value co-creation in the platform. In this sub-section, we discuss the value co-creation mechanisms and identify value co-creation practices.

From an industrial marketing management perspective, IMP Group researchers have developed the Industrial Network paradigm with its emphasis on value co-creation (Jaakkola and Hakanen, 2013, pp.47-58; Kohtamäki and Rajala, 2016, pp. 4-13; Lacoste, 2016, pp.151-162). In the B2B context, the co-creation of value is realized through interactions among the firms and its network of various actors (e.g., customers, suppliers, distributors) (Perks, Gruber, and Edvardsson, 2012, pp.935-951; Marcos-Cuevas, et al., 2016, pp.97-107). In the management literature, the S-D logic (Vargo and Lusch, 2008, pp.1-10) has set value co-creation as a new paradigm to be understood as a 'joint, collaborative, concurrent, peer-like process of producing new value, both materially and symbolically' (Galvagno and Dalli, 2014, p.644). Value co-creation, therefore, extends beyond the present interaction between a customer and a supplier, and includes heterogeneous relations of artifacts, processes, interfaces, and persons (Ramaswamy and Ozcan, 2018, pp. 196-205).

However, as proposed by Storbacka et al., (2016, p. 3008), 'value co-creation is difficult to observe empirically', and in order to theoretically develop the service perspective further, researchers must pay more attention to the micro-foundations that underpin SDL's macro-constructs. Kohtamäki and Rajala (2016, p. 7) offer the following reason for the need of practice theory as an approach to observe micro-foundations of macro-phenomena: 'The practice theoretical perspective emphasizes the micro-level practices conducted by the economic agents, thus highlighting both the individual and the social nature of practices'. From this perspective, value co-creation practices refer to

activities and interactions involved with network actors, where participants co-create value within a specific social context (Frow, McColl-Kennedy, and Payne, 2016, pp.24-39; Kohtamäki and Rajala, 2016, pp. 4-13).

Using a practice theory perspective, the literature has explored the value co-creation dynamics in a platform context. Here, we identify three key constitutive elements of value co-creation practice: actor motives, practice forms, and practice stages.

First, the motive for engaging in value co-creation activities is a starting point (Frow, et al., 2015, p. 470). The motives of value co-creation explains why firms are willing to engage with a network of actors. For all participants, 'identifying their contribution motives and perception of value is essential to the alignment of interests' (de Oliveira and Cortimiglia, 2017, p,751). Reypens, Lievens and Blazevic (2016, p45) address that participants have different motives for being involved in value co-creation, ranging from commercial (e.g., efficiency improvement) to scientific (e.g., public research). Based on the literature (Frow, et al., 2015, pp.463-483) nine motives for value co-creation are identified: access to resources, enhance customer experience, create customer commitment, enable self-service, create more competitive offerings, decrease cost, faster time to market, emergent strategy, and build brand awareness. This diversity in motives influence the value co-creation practice between firms and other actors.

Second, the form of value co-creation is the core element to observe the interaction and resource sharing between different actors (de Oliveira and Cortimiglia, 2017, p,750). The co-creation form differs at different stages of firm's operating process. For instance, at the stage of production process (or from the industrial perspective), value co-creation occurs in forms of co-design, co-development, co-manufacturing, co-promotion and co-distribution (Rayna, Striukova, and Darlington, 2015, pp.90-102). And at the value-in-use process (or from the commercial perspective), where actors together generate the customer experience and enable customers to reach their goals, the forms of value co-creation range from co-diagnosis, co-ideation, mutual adaptation (Kohtamäki and Rajala, 2016, pp. 4-13). According to Frow, et al., (2015, pp.463-483) the forms of value co-creation are concluded in twelve kinds: co-conception of ideas, co-design, co-production, co-promotion, co-pricing, co-distribution, co-consumption, co-maintenance, co-outsourcing, co-disposal, co-experience, co-meaning creation. Beside these co-creation forms, the authors acknowledge that new forms of value co-creation may emerge in the future.

Last, the stage of value co-creation is an important element. Building on the capability theory (Karpen, et al., 2011), Marcos-Cuevas, et al., (2016, pp.97-107) classify the value co-creation practices into three stages: linking (i.e., mobilizing social connections and networks), materializing (i.e., operational practices related to the production of offerings) and institutionalizing (i.e., the design of institutions and structures for continuously capturing the value). Different types of value co-creation practices are grouped into the above three stages. The authors acknowledge that each category is not happening in a liner order, and may take place simultaneously (such as linking and materializing). The practice stage typology (Marcos-Cuevas, et al., 2016, pp.97-107) provides a lens for firms to implement value co-creation in the real world. This classification is similar to the platform leverage model proposed by Eloranta and Turunen (2016. pp. 178-186) encompassing three processes of connecting actors, sharing resources and integrating systems.

Based on the above three key constitutive elements of value co-creation practice (i.e., actor motives, practice forms, and practice stages), we seek to describe the value co-creation practice characterized

by different platform leverage logics. Table. 1 highlights the expected core constitutive elements for four platform leverage logics: the transaction-incremental (TI), transaction-radical (TR), production-incremental (PI), and production-radical (PR) innovations. Each of the four logics has corresponding types of value co-creation practices, for which we highlight: (A) the actors' motives, (B) the forms of value co-creation, and (C) their focus in value co-creation process (i.e., the importance of each value co-creation practice stage).

Table 1. Value co-creation practice in value platforms

	(1) TI Logic	(2) TR Logic	(3) PI Logic	(4) PR Logic
A. Actor motive	- Access to resources - Enhance customer experience	Same with TI, and plus: - Create customer commitment - Enable self-service	- Decrease cost - Faster time to market - Create more competitive offerings	Same with PI, and plus: - Emergent strategy (e.g., in the IoT context)
B. Practice form	- Co-diagnosis - Co-consumption - Co-promotion - Co-experience - Mutual adaptation	- Co-ideation - Co-experience - Co-maintenance - Data sharing & analysis - Co-meaning creation	- Co-diagnosis - Co-design - Co-manufacturing - Co-distribution - Mutual adaptation	- Co-ideation - Co-design - Co-manufacturing - Data sharing & analysis - Co-meaning creation
C. Practice stage	- Linking (3) - Materializing (1) - Institutionalizing (2)	- Linking (1) - Materializing (3) - Institutionalizing (2)	- Linking (3) - Materializing (1) - Institutionalizing (2)	- Linking (1) - Materializing (3) - Institutionalizing (2)

Note: 1= most important, 3= least important
Key references: Frow, et al., 2015, pp.463-483; Marcos-Cuevas, et al., 2016, pp.97-107.

A. The actors' motives are different in four platform leverage logics.

Based on the article by Coreynen, et al., (2017, pp.42-53) we could claim that the back-end unit aims to effectively and efficiently create solutions, and therefore there are requests for more efficiency improvements (e.g., decreasing cost, faster time to market, and creating more competitive offerings). Compared to the front-end unit where firms aim to better understand the customer's value creating process and create customer benefits (Coreynen, et al., 2017, pp.42-53), there is more need to create customization opportunities and increase the quality of customer relations (e.g., having the access to customer resources and enhancing customer experience).

According to the degree of newness and radicalness of value co-creation to the markets, the article of Snyder et al., (2016, pp.2406-2407) points out that, 'A radical innovation typically means new to the market (i.e., customers), whereas incremental innovations probably are new to the firm'. Therefore, compared to TI logic which aims at incremental changes within the firm, TR logic involves substantially new technology (e.g., digital technologies to enable self-service), and aims to create customer commitment (e.g., through providing substantially greater customer benefits).

The article by Oh et al., (2016, p.4) claims that incremental innovation will produce current user benefits more cheaply, but it will not create new user benefits. Based on this, the main motive of PI logic is more related to efficiency improvement. In case of an uncertain operating environment (e.g., the IoT context), some firms choose emergent strategies to embrace the opportunities, as their main motive in PR logic.

B. Depending on the actors' motives, the value co-creation takes place in many forms.

Based on article of Forés and Camisón (2016, pp.831-848) we claim that in incremental innovation most ideas come from the marketplace and are utilized to enhance existing internal competencies.

Therefore the start point for participants in incremental innovation is co-diagnosing the existing products, processes, technologies, organizational structure and methods. By contrast, in the case of radical innovations, firms need to introduce next-generation technologies (e.g., IoT data sharing & analysis) with the potential to break the established linkages of dominant current ecosystems. Hence, there is more need for getting searching for and get acquainted with new partners and new ideas (i.e., co-ideation) in radical innovation.

Based on the article by Kohtamäki and Rajala (2016, pp. 4-13) we claim that the value co-creation related to the front-end units aims at encouraging all participants in generating customer experience. Hence co-experience is a common form for transaction logic. Given the incremental and radical nature of innovation, value co-creation practice related to TI logic is more focused on efficiency improvement (e.g., co-consumption and co-promotion), whereas in the TI logic it emphasizes offering new solutions (e.g., breaking down their offerings into services related to co-maintenance). In contrast, the back-end work is sealed off from customer contacts so that it concerns more on production improvements (Broekhuis, De Blok, and Meijboom, 2009, pp.971-980). Therefore, value co-creation often takes place in the forms of co-design and co-manufacturing in the production logic. For efficiency improvement in logistics, co-distribution is the featured form in the PI logic.

For disruptors, a critical task is to manage the paradox of radical innovation that the radical changes bring a significant increase in the development costs for platform participants (Ozalp, Cennamo, and Gawer, 2018, pp.1203-1241). Hence, there is more need to stitch together a new viable ecosystem around the radical innovation, developing norms and standards among all participants for platform survival (i.e., co-meaning creation)(Kumaraswamy, Garud, and Ansari, 2018, pp. 1025-1042). Whereas incremental innovation performance entails the refinement and reinforcement of existing business processes (Forés and Camisón, 2016, pp.831-848), it does not require a new norm beyond existing business, but mutual adaptions to enhance existing internal competencies.

C. According to the degree of digital innovation, the practice focus in the value co-creation process can be divided into different levels (e.g., the low level materializing-oriented and high level linking-oriented).

Based on the article of Kohtamäki and Rajala's (2016, pp. 4-13) value co-creation typology we claim that in the incremental innovation cases firms work with limited, known partners and henceforth there is less need for searching new partners. In this case, more efforts are put on the materializing stage and there is more need for operational practices related to co-production. As the external resources added in the current system, successfully managing the relationships among all participants is critical for sustaining the value created. Therefore, in incremental innovation the materializing is key.

Based on an article of Frow, Mccall-Kennedy and Payne's (2016, pp.24-39) radical innovation case in health care industry we can expect: when 'emerging new value system' then firms need larger network and unknown partners for rich ideas, when 'encountering co-destructive behavior' then firms need a shared language and new value propositions as a balance, and the materializing process is considered afterwards. Therefore, the linking stage will be dominant in the radical innovation.

Using the preliminary platform leverage - value co-creation practice framework as a basis, the aim of this research is to study how value co-creation is implemented in Industry 4.0/ IIoT platforms. Specifically, it tries to answer the following research questions: (i) What co-creation practices do companies use and combine in value platforms? and (ii) What changes do companies made to reach the ideal position of platform-based business models?

3 Methodology

3.1 Research design and sampling

We conduct an interpretive study because the topic of platform leverage is new and scarcely explored, and the interpretive methodology uncovers new relationships among key dimensions of over relatively unstructured, dynamic market strategy (Matthyssens and Vandenbempt, 2003, p. 595). We respond to Möller and Halinen's (2017, pp.5-22) call for more interpretive studies that investigate the dynamic development of a platform rather than carrying out studies that only capture single instance or occasion. For detailed analysis of the phenomenon and for comparison across cases, a comparative multiple-case design as advanced by Eisenhardt (1989, pp. 532-550) and Yin (1994) was selected. This methodology is regarded as one of the best bridges linking rich qualitative evidence and deduction logic, in order to address specific and emerging research areas (Eisenhardt and Graebner, 2007, pp. 25-32).

Our empirical database consists of data on four Chinese textile companies. We focus on the textile sector for three main reasons. Firstly, the textile sector is one of the most targeted sectors to align the agile manufacturing and customization in the IIOT. As this sector is characterized by specialized SMEs, better integration of the network and intensification of the collaboration would bring significant benefits. Secondly, textile companies are strongly committed to strengthening their competitive position in the market affected by the challenges of a long period of economic crisis and the ever shrinking labor supply. Thirdly, large textile companies have undertaken a series of intense platform-based value co-creation practices that strengthen the use of local resources, exploit advanced manufacturing techniques and open cross-sectorial collaborations and strategic network clusters. We thus respond to Möller and Halinen's (2017, pp.5-22) call for platform research in more specific fields, Ghobakhloo's (2018, pp.910-936) call for strategic management research in more specific companies in the digital transformation towards Industry 4.0, and Pagani and Pardo's (2017, pp.185-192) call for more cases of B2B companies' digital changes and the transformation journey by investigating how textile manufacturers formulate and implement their platform strategies and what value co-creation practices they applied, combining the process, content and context dimension of analysis.

For the selection of the cases, we took into consideration firms located in China. Despite the rising labor costs, the rapid RMB currency fluctuation and the lower demand from export markets, China's textile industry still keeps growing at a relatively healthy pace and intends to dominate the global textile sector, both as a producer and a consumer. The textile industry is one of the key sectors of China's industrial reform called 'Made in China (MiC) 2025 plan'[1] which is partly inspired by Germany's Industry 4.0 initiative (Li, 2018, pp.66-74). In order to increase the cost-effectiveness

[1] 'Made in China (MiC) 2025 plan' seeks to move China from a low-cost manufacturer to a direct added-value competitor. Some frontrunner manufacturers have responded to the call of MiC 2025 and recognized the use of the IoT in manufacturing, employing digital networking of production to create smart manufacturing systems within and beyond the factory to both customers and suppliers.

and better manage the infrastructure, a great number of China's textile factories start to develop the smart factory.

The cases are selected via theoretical sampling and identified by industry experts. All companies are pioneers selected from '2017 China smart manufacturing pilot demonstration project in the textile industry'. The selected companies have strong symptoms of platform-type operations and demonstrate characteristics of 'intelligent strategies' (the companies themselves refer to the term 'intelligent' when analyzing their platform strategies). Our cases include firms that have consistently applied platform strategies, and have started platform building over time. In reality, most manufacturers and especially the smaller ones are not ready for the full digital transformation (Ghobakhloo, 2018, pp.910-936). This research focuses therefore on large organizations rather than on SMEs because the inclusion of smaller players would have limited the platform transformation areas. Platform-based value co-creation practice in the large textile companies in China stands out as an interesting and successful example which engages cross-sectorial networks. We thus enrich Li's (2018, pp.66-74) research on the upward trajectory in China's manufacturing industry and her understanding of MiC 2025 plan by exploring the changes in a more specific textile sector in China.

3.2. Data collection

Over the last two years, we have collected data through different waves. First, secondary research on smart production/e-commerce developments in the textile industry was undertaken based on several studies from universities, government and institutes. Next, four best practice cases were identified and additional Internet research was done. Finally, several interviews took place in four case companies.

Interviews have been conducted following a semi-structured questionnaire with open questions (Patton, 1990). Each interview targeted platform strategies and the associated value co-creation practices. The interview included three parts with six questions: (a) For 'challenges' 1) What problems and troubles are the firms confronted with? 2) Why does the platform approach seem appropriate to reach the objectives? (b) For 'solutions' 3) What platform strategies do the firms take, especially the initial innovations and evolutions? 4) How do they use value co-creation practices to arriving there? (c) For 'outcomes' 5) What differences have the platform strategies made to the firms' business? and 6) What facts and figures illustrate the impact on their business?

For the better knowledge of their strategic developments, the interviews were carried out with representatives from the top management, the marketing (or the front-end) department and the production (or the back-end) department. In addition, this provided an understanding of the drivers, inhibitors, steps and practices of companies' platform strategies.

3.3. Detailed case descriptions

The four companies developed their businesses in a specific area of east China that represents an industrial cluster specialized in textile products. Two of them are fiber manufacturers (i.e., Co. Huaxing and Co. Huading) and the other two are apparel manufacturers (i.e., Co. KuteSmart and Co. Ruyi). Ruyi and Huading are listed companies, while KuteSmart and Huaxing are private companies. The four textile companies gradually developed their platform strategies, and are considered as established examples of the successful transition to IIOT business models. The main features and platform strategies of the four companies are presented in Table 2.

Table 2. Profile of four textile companies

	Co. KuteSmart	Co. Huaxing	Co. Ruyi	Co. Huading
Industry	Apparel manufacturing	Yarn manufacturing	Wool fabric and apparel manufacturing	Nylon filament manufacturing
Number of employees / Turnover (year 2017)	3,000+ / CNY 0.6 billion	3,000+ / CNY 1.0 billion	4,000+ / CNY 1.2 billion	2,000+ / CNY 2.8 billion
Date of creation / Business ownership	2007 / Privately owned company	1987 / Privately owned company	1972 / Listed company	2002 / Listed company
Key platform strategy	Developing a data-driven mass customization platform of man's suit and offering industry 4.0 solutions in B2B market	Establishing platform-based smart spinning factories and utilizing B2B e-commerce platforms to reduce the procurement costs and increase the profits.	Establishing a cloud-based smart factory encompassing the whole apparel supply chain, building a customization platform directly connecting clients and factories	Building a platform-based smart factory producing nylon filament and using an e-commerce approach to the B2B market
Number of interviews/ respondents	1 / Vice President 1 / Marketing Director 1 / Production Manager	1 / Chief Executive Officer 1 / Chief Technology Officer 1 / Marketing & Sales Director	1 / Chief Operation Officer 1 / Chief Technology Officer 1 / Marketing Director	1 / Chief Research Officer 1 / Operation Director 1 / Marketing Director

All of the four companies have been heavily impacted by the global 2007–2009 crisis and the following huge market demand reduction. In addition, there were challenges from the facts that China's working labor population has been gradually decreasing and the cost advantage has been quickly declining. Faced with such situations, the four companies started to make a change and tried to grab the chance enabled by digital technologies.

Therefore, all the four companies responded to the call of MiC 2025 initiative and restructured the business towards smart factory business models. KuteSmart created a data-driven mass customization platform and offered industry 4.0 solutions in the B2B market. In the case of Huaxing, the company put a lot of investment in developing advanced spinning workshops based on smart machines and integrated operation platforms. To reduce the procurement costs and increase the profits, Huaxing set up collaborations with B2B e-commerce platforms. Ruyi developed a smart factory encompassing the apparel manufacturing processes across the supply chain and establishing a customization platform for business customers. As for Huading, it established a digital factory to produce polyester, together with a digital service platform supporting the factory operation. Moreover, Huading utilized an e-commerce approach for a quick response to the market request.

4 Findings

In this section, we present the findings of the study in relation to the four cases. We start by reviewing how the selected case companies developed their platform strategies and what value co-creation practices they applied (Section 4.1). Subsequently, we identify the trajectory of companies' platform strategy changes in the platform-based business models (Section 4.2).

4.1 Value co-creation practices in platforms

Based on the preliminary platform leverage - value co-creation practice framework (proposed Section 2), the findings of Section 4.1 are presented along with the motive and the practice of value

co-creation, identifying the value co-creation focus of different platforms. Table 3 provides an overview of the key findings.

4.1.1 Co. KuteSmart: Mass customization platform builder and smart factory solution provider

KuteSmart is a global customized apparel supplier, engaging a workforce of 3,000 committed to the version of 'better life enabled by customization'. The company has many years of OEM experience and has a good reputation around the world. The development of mass customization business was primarily driven by the requests from the overseas customers to be offered simplified, flexible and individualized service. The idea of applying customization in mass production was new to China's apparel industry at that time, but many of KuteSmart's competitors were moving towards it. To avoid losing the first-mover advantage, KuteSmart's founder made a quick response to customization and started to reconfigure the production foundation.

The transformation was not straightforward, therefore KuteSmart took multiple steps to reach the customization business and gradually achieved mass production. In 2011, for the purpose of increasing production efficiency, KuteSmart's founder started to transform the traditional factory at the cost of CNY 250 million. The transformation required a focus on the materializing stage, "To make the old settings fit the new systems", in the vice president's word. To this end, KuteSmart broke down the manufacturing production line of a suit into over 300 detailed procedures, and each procedure was carried out by the worker facilitated with an electronic screen. Workers read all the requirements of orders by swiping an RFID-enabled tag. Unlike some companies that used robots for automatic production, KuteSmart did not reduce its worker count. The production manager commented, "This model was co-designed with engineers and designers, and was very appropriate for China's current situation."

Unlike the standardized production, the mass customization demands for flexibility to form temporary, reconfigurable production lines. It was apparent for KuteSmart's top management that the core to achieve flexible production was the technological innovations, therefore the company kept an open mind in linking IT resources. Since 2011, KuteSmart has built eight research centers and supported collaborative work with universities and research institutes. The top management considered the lack of control over collaborators as a risk related to technological innovations, hence KuteSmart put the value co-creation control at the core.

For clients, mass customization means applying their ideas into personalized orders. To this end, KuteSmart has developed a platform which allowed customers to identify, customize, and integrate KuteSmart's design and manufacturing resources to suit their needs. In 2016, the platform was launched, supporting customers to design and modify every detail with real-time communication. KuteSmart promoted linkages amongst its material and accessory partners to jointly work with a broad range of KuteSmart's research and development teams under the so-called "Co-innovation hub". Based on the "hub", KuteSmart developed a "Customization Big Data Center" that covered 99.9% of the individual design requirements. KuteSmart fostered openness within the "hub", leading to the creation of useful solutions. Using KuteSmart's service, it took only 7 business days from submitting an order to shipping personalized products, compared with up to six months for conventional tailoring. For customers, KuteSmart stood for enhanced efficiency, great experience and sustainability.

The mass customization platform as a co-created and integrated service offering has constantly evolving to be the solutions for manufacturers. In 2016, KuteSmart got the national prize for its digital transformation. Since then, KuteSmart jointly established a practice base with the national IT ministry and exported smart factory solutions to manufacturers who used to be KuteSmart's competitors. By the end of 2018, KuteSmart has served about 70 companies of 20 industries, ranging from apparel, machinery, building materials, jewelry, and food industry. The successful implementation of mass customization platform has helped the prototypical 'low tech' apparel manufacturer to get most of the profit.

4.1.2 Co. Huaxing: Establisher of smart spinning factories adding customer-centric e-commerce

Established in 1987, Huaxing is the national leader in the cotton spinning sector and the largest yarn exporters in the east of China with customers from more than 60 countries, employing 3,000 staff globally. Huaxing used to be a traditional labor-intensive company in the early 2000s. However, its competitiveness has been heavily challenged by the increasing labor cost in China and the market pressure resulting from the global economic crisis of 2008-2009. Taking the opportunity of industry 4.0, Huaxing's top management has shifted its focus on smart manufacturing adding e-commerce. Over the years, this strategy has been proved highly successful.

In 2014, the first step saw Huaxing committed a joint investment of CNY 1 billion with the state governments and a state-owned company in transforming the traditional spinning factory. As Huaxing states explicitly on its website, "The utilization and expansion of smart technology is an essential part of Huaxing's transformation process". Huaxing enhanced the cooperations with manufacturing equipment suppliers (e.g., machines, robots, and assembly lines), leading to the creation of smart production line.

The next step saw implementing the Integrated Cyber-Physical System (ICPS). Huaxing found that traditional computer-aided application tools (e.g., CAD, CAE, CAM) were standalone systems and lacked communicating and collaborating across the production process. Huaxing aimed to develop the ICPS to address the problems. Huaxing promoted linkages with software suppliers and industry experts, leading to the ICPS-related solutions (e.g., cloud-based big data analytics tools, distributed computational modeling techniques and simulation tools). The joint work has been proven to fit well in Huaxing's ICPS. In the words of CEO, "The joint innovation capability is the core to Huaxing's competitiveness".

The yarn market is characterized to be highly sensitive to price and delivery time. "Through e-commerce platforms, Huaxing got the quickest pass to enter the market," said the CEO. Huaxing supported interactions with customers, listened to their voices and co-created mutual competitive advantages. The cooperative culture fostered by the founder also facilitated the engagement with customers. In 2016, Huaxing was highly praised by the national textile industry association, "The smart technology of Huaxing has reached a high level in the industry, and we suggest to speed up the pace of technology adoption and application." In order to make full use of the knowledge and patents of smart spinning, Huaxing intended to offer training courses for manufacturers in need of digital transformations.

4.1.3 Co. Ruyi: Builder of vertically integrated supply chain adding mass customization

Headquartered in China, Ruyi is a global business with customers across 6 continents that engages a workforce of 4,000 devoted to the vision of “wisdom for customers”. Ruyi provides textile and apparel products, brands and solutions, based on a complete supply chain from “the material to the human body”. The company is a key provider and partner of a wide range of luxury brands globally. In 2010, Ruyi found itself wanting to expand its reach into the fast-growing “accessible luxury” segment and to further build up the position of global leading fashion brand owner and manufacturer. To achieve this goal, Ruyi has developed a vertically integrated value chain as the manufacturing foundation, offering flexible and individualized service.

Around 2010, Ruyi found itself unable to accept additional customers unless it upgraded the manufacturing capacity. In addition, the current customers demanded for more stabilized high-quality products and faster delivery than they had in previous years. This led to Ruyi to place a strong focus on “the intelligent equipment” in the words of Ruyi’s COO. Ruyi supported collaborative work with third-party suppliers. Ruyi co-developed the digital printing technology in the dyeing and printing business with its suppliers, leading to significant pollution reduction and product quality improvement.

To achieve flexible production, a further step saw Ruyi beginning to transform the centralized standalone system, to the web-based distributed manufacturing system. Ruyi developed a so-called “talent network” program under which the internal and external knowledge resources were linked, stimulating technological innovations. The stage of linking resources was the key to achieve flexible production. Ruyi also put the patent protection in the first place, which enabled generating trust with the collaborators (the third parties which used to be Ruyi’s traditional competitors). In 2016, Ruyi co-designed the smart spinning production line with third-parties and jointly launched the production line by cooperating with one of the key regions mentioned by China's “One Belt, One Road” initiative. The smart production line powered Ruyi of the mass customization capacity, essentially enhancing Ruyi’s core competitiveness in the global market.

To satisfy consumers’ individualization expectations, Ruyi sought to collaborate with designers and IT suppliers to create a customization system, providing multiple design options and closely matching consumers' individual preferences. A number of apparel retailers who were the customers for Ruyi’s OEM apparel products started to use the platform to place orders. Some customers, who chose Ruyi services but could not visit its stores for measurement, hesitated in putting online orders because of the difficulties in measurement. The company has noticed the clients’ needs and is now in the process of integrating new technology (e.g., remote measurement technique) to further develop the customization platform.

For meeting the individual needs of the high-end customer, in 2018, Ruyi reached the strategic cooperation with the world's only listed luxury e-commerce company Secoo to jointly develop a high-end smart retail platform. Many of the internationally renowned brands under Ruyi will collectively participate in the omnichannel platform of the e-commerce and physical stores under Secoo. Together Ruyi and Secoo will explore the marketing model of “Manufacturer to Brand to Customer” (M2B2C) in the fields of smart retail.

4.1.4 Co. Huading: Nylon filament supplier armed with smart factory and cross-border e-commerce

Founded in 2002, Huading is a leading manufacturer and supplier in China's nylon filament industry, employing 2,000 staff. Serving customers in China, Europe, America and the Middle East, Huading pursues sustainable profitable growth in all its activities and generated combined sales of CNY 2.8 billion in 2017. The company's slogan "win-win cooperation" synthesizes its unique approach to co-create value with its business partners. Inspired by the MiC 2025 initiative, Huading has formed a dual-major of the digital factory and cross-border e-commerce. These actions were thought to address the problems resulting from the labor shortage, aiming to achieve cost reduction and timely response to customers' requests.

In 2015, the state government encouraged and supported the manufacturing industry to cooperating with the digital sector to restructure, transform and upgrade traditional production. Inspired by the government, Huading launched a digital factory producing nylon filament. Huading introduced advanced machines from Italy, Belgium and Germany, and remained stable connections with the suppliers as the application of equipment required constant collaborations with the partners.

Next, Huading found it needed to develop an integrated operating system, allowing individual production cells to collaborate in a networked way. To this end, Huading shifted the focus on internal innovation. "In terms of technological innovation, the company always put intellectual property protection in the first place", said by the respondent. Huading established an internal "research and development business unit" to create a network of innovation competence within the company so that they could protect information. In 2017, Huading successfully launched the integrated operating system.

The nylon filament business is highly susceptible to market fluctuations. After the acquisition of a cross-border e-commerce company, Huading realized it had the license to enter the global markets. By collaborating with the e-commerce platform, Huading harnessed the customer-related data (e.g., behavior data, purchasing data, comment data) and further benefited from translating the customer voice into product features and quality requirements. For leveraging customer data, the co-creation practices related to the materializing process were the focus of this stage. In 2017, Huading received a national best practice award for smart manufacturing due to its digital transformation. In the next step, Huading plans to leverage the technologies and deliver them to traditional factories. "Through offering digital solutions we may generate additional revenue", said the marketing director.

Table 3. The four companies' key value co-creation practices in platforms

	Co. KuteSmart	Co. Huaxing	Co. Ruyi	Co. Huading
Step 1	Incident: Developing a digital suit production line - Motive: For improved production efficiency - Key VCC practice: Co-designing the distributed production line with engineers and designers; RFID-facilitated Human-Machine co-manufacturing - Key stage: Materializing - Platform logic: PI	Incident: Building a digital spinning factory - Motive: For enhanced efficiency and productivity, and reduced labor usage and operation cost - Key VCC practice: Co-designing with hardware suppliers; Co-launching with government and third parties - Key stage: Materializing - Platform logic: PI	Incident: Employing digitally advanced production facilities - Motive: For reduced lead time and more stabilized product quality - Key VCC practice: Co-designing with suppliers in the digital dyeing and printing business - Key stage: Materializing - Platform logic: PI	Incident: Launching a digital factory producing nylon filament - Motive: For reduced lead time and more stabilized product quality - Key VCC practice: Co-designing with suppliers in the digital dyeing and printing business - Key stage: Materializing - Platform logic: PI

	Co. KuteSmart	Co. Huaxing	Co. Ruyi	Co. Huading
Step 2	Incident: Building a Cloud-based manufacturing platform - Motive: For achieving flexible production - Key VCC practice: Promoting co-ideation based on research centers, universities and institutions; Setting rules to control the innovation network - Key stage: 1. Linking, 2. Institutionalizing - Platform logic: PR	Incident: Developing an integrated Cyber-Physical System - Motive: For collaborations across the production process. - Key VCC practice: Co-designing with software suppliers and industry experts - Key stage: Linking - Platform logic: PR	Incident: Developing a web-based distributed manufacturing system - Motive: For improved machine utilization and more flexibility in production - Key VCC practice: Building the "talent network" program; Setting rules; Co-designing with firm partners; Co-launching with a government partner - Key stage: 1. Linking, 2. Institutionalizing - Platform logic: PR	Incident: Developing an integrated operating system - Motive: For collaborations in a networked manufacturing setting - Key VCC practice: Establishing a research department and encouraging internal co-innovation - Key stage: Linking - Platform logic: PR
Step 3	Incident: Establishing a mass customization platform - Motive: For suiting clients' individualized needs - Key VCC practice: Linking material and accessary suppliers to the "Co-innovation hub"; Analyzing data collected in "Customization Big Data Center"; Enabling real-time communication in co-designing with clients - Key stage: 1. Linking, 2. Materializing - Platform logic: TR	Incident: Developing a B2B e-commerce platform - Motive: For creating connectives with customers and reducing time to market - Key VCC practice: Interacting with customers; Listening to their requirements and comments; Mutual adaptation; Nurturing cooperative culture within the platform - Key stage: 1. Materializing, 2. Institutionalizing - Platform logic: TI	Incident: Building a mass customization platform - Motive: For satisfying clients' individualized expectations - Key VCC practice: Connecting designers and IT suppliers for ideas on the customization system; Transferring Ruyi's offline clients into the platform; Continuously developing the key technology - Key stage: 1. Linking, 2. Institutionalizing - Platform logic: TR	Incident: Developing cross-border e-commerce - Motive: For the quick response to market request - Key VCC practice: Interacting with customers; Collecting and analyzing customer data; Turing their voices into product features and quality requirements - Key stage: Materializing - Platform logic: TI
Step 4	Incident: Building a solution platform for manufacturers - Motive: For serving customers in other industries and creating more sources of revenue - Key VCC practice: Cooperating with the national IT ministry and jointly establishing a practice base for manufacturers - Key stage: Materializing - Platform logic: TR	/	Incident: Developing a high-end smart retail platform - Motive: For meeting the individual needs of high-end customers - Key VCC practice: Collaborating with the world's only listed luxury e-commerce company Secoo in the fields of smart retail and develop the marketing model of M2B2C - Key stage: Materializing - Platform logic: TR	/

4.2 Platform-based strategies for manufacturers

All case companies look for ways to open new business opportunities and add values by leveraging platforms (Figure 1). Taking a cross-case perspective to the presented case (Section 4.1), we observe three distinct transition trajectories across the platform leverage logics. We display the case companies' trajectories in the platform leverage logic framework (Figure 2). Figure 2 shows a start point and three trajectories that can be followed or combined: (1) Starting from offering standard products; (2) Plus customer-centric offerings; (3) Plus value-adding service; and (4) plus integrated personalized solutions.

Three "natural combinations of trajectories" pop up from the analysis in this industry: (1) Standard products are combined with customer-centric offerings (e.g., KuteSmart, Huaxing, Ruyi and Huading); (2) Standard products adding customer-centric offerings might be followed by value-adding service (e.g., Huaxing and Huading); or (3) plus integrated personalized solutions (e.g., KuteSmart and Ruyi).

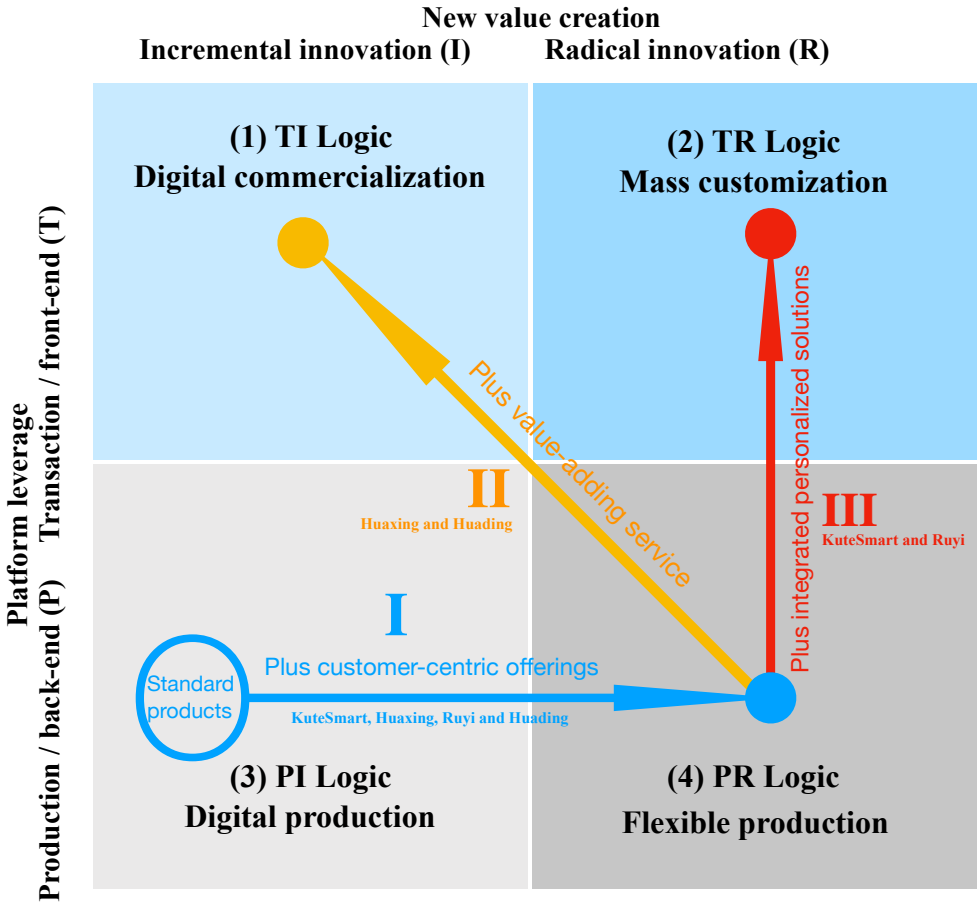

Figure 2. Case companies' evolution in platform leverage logic framework

For "◯", the start point for manufacturers is utilizing digital tools to enhance and consolidate the back-end manufacturing capacity of standard products. In the digital age, digital technologies were widely applied in manufacturing processes. The exploitation and integration of digital technologies leads to potential benefits of increases in productivity, incremental innovations in value creation (Matt, Hess and Benlian, 2015, pp.339-343). Some companies such as Huaxing, Ruyi and Huading used smart machinery (e.g., robots) to achieve digital and autonomous production. By utilizing the IoT devices such as RFID-enabled tags to link human workers, typical machines and products, KuteSmart reached digital production, leading to optimized workflow and faster production. After consolidating the back-end production, companies followed the customer-centric offering route. As observed in all the cases, after implementing digital production in the factory or the production line, the four companies moved to more customer-oriented offerings.

For "I", the first route is similar to Coreynen, Matthyssens and Van Bockhaven's (2017, pp.42-53) industrial path to servitization, and Jaakkola and Hakanen's (2013, pp.47-58) industrial approach towards solution networks. In the route of adding customer-centric offerings, the manufacturer exploits a shared collection of diversified and distributed manufacturing resources to support the customer-centric and on-demand production. This route is considered as an inside-out process which requires a reworked back-end production and supply foundations adaptable to demand changes. The observed companies display the capacity of flexible production, leading to improved resource use and production efficiency. Ruyi and Huading used the integrated operating system to speed up the on-demand production and reduce lead time. KuteSmart and Huaxing utilized the integrated manufacturing platform not only for facilitating production, but also for leveraging their experience to provide solution business for a new source of customers. After implementing the

back-end reconstruction adaptable to customers' needs, companies shifted the focus to front-end optimization, following either a more integrated personalization solution or a value-adding service route.

For "II", the second route is in line with Coreynen, Matthyssens and Van Bockhaven's (2017, pp. 42-53) commercial path to servitization, and Jaakkola and Hakanen's (2013, pp.47-58) marketing approach towards solution networks. In the route of plus value-adding service, the manufacturer aligns its value creation routines with the customer by utilizing digital commercialized channels, streamlining front-end interactions. This route is considered as an outside-in and customer-oriented process, demanding for the capacity to capture customers' demands, fulfill their needs and sustain the good relationship. As observed in Huaxing and Huading, by applying the e-commerce platform, both companies achieved the extension of commercial reach and the quick response to market request. Huaxing and Data benefited from the translating of the customer-related data (e.g., behavior data, purchasing data, comment data) into product features and quality requirements, leading to Huaxing and Data's competitive advantage in the market.

For "III", the last route is in alignment with Coreynen, Matthyssens and Van Bockhaven's (2017, pp.42-53) value-dominant path to servitization, and Jaakkola and Hakanen's (2013, pp.47-58) integrated approach towards solution networks. In the route of plus integrated personalized solutions, the manufacturer re-conceives integrative solution packages for enhanced customer value, leading to a relatively radical impact on the interaction in the value chain. In the age of Industry 4.0, manufacturers began to leverage smart technology to promote advanced manufacturing models to offering customers in-house manufacturing experience, such as IT-enabled mass customization and cloud-based design and manufacturing (Lu, 2017, pp.1-10; Wu et al., 2015, pp.1-14). As observed in KuteSmart and Ruyi, both of the companies developed a mass customization platform and involved customers in the process of individualization production, generating a quantum leap in value co-creation.

5. Conclusions

5.1 Theoretical contributions

This study aims to provide a framework for understanding how the leverage logics can be used to enhance value co-creation through platform-based business models in the context of Industry / IIoT. This article contributes to the IMP (Industrial Marketing and Purchasing) Group's research by linking the recent focus of the network literature, the value co-creation view, and the recent strategic management insights on network management to the recent value platform context. We highlight how platform leverage logics can be used to enhance value co-creation through upgraded business models. In this way, we respond to the call of Marcos-Cuevas, et al., (2016, pp.97-107) for value co-creation research under more in-depth condition. As such, it addresses a timely topic and provides a rich categorization of value co-creation practices in platform-based business models.

Building on a platform typology, we set out to provide a classification of platform leverage logics. Based on the radical and incremental nature of technological innovations, this study extend the architectural leverage logic (Thomas, et al., 2014, pp. 198-219) into two dimensions (i.e., the vertical incremental & radical innovation, and the horizontal transaction & production leverage), resulting in four categories: transaction-incremental (TI), transaction-radical (TR), production-incremental (PI), and production-radical (PR) innovations (see Figure 1). In this way, this study

contributes to the literature on platform orchestration and platform strategy/development (Thomas, Autio and Gann, 2014, pp. 198-219; Eloranta and Turunen, 2016, pp. 178-186; Perks et al, 2017, pp. 106-121).

This research constructs the basis for a theory that extends the ARA (actor, resources and activities) model (Håkansson and Johanson, 1992, pp. 28-34) on the practice lens. We identify three key constitutive elements of value co-creation practice: actor motives, practice forms, and practice stages. Building on the three key constitutive elements, we describe the value co-creation practice in different platform leverage context. Our cases offer important empirical insight into some of the actual processes of co-creation in the Chinese textile industry, uncovering the value co-creation practices they applied to develop platform strategies.

Using an interpretive methodology, we observe four cases of Chinese textile manufacturers transforming to a platform-based business model. We respond Kohtamäki and Rajala's (2016, pp. 4-13) call for research on how digitalization impact on the practice of value co-creation, and Frow, Mccall-Kennedy and Payne's (2016, pp.24-39) call for additional studies on value co-creation practices in platform-related settings. We also respond to Möller and Halinen's (2017, pp.5-22) call for more interpretive studies that investigate the dynamic development of a platform rather than carrying out studies that only capture single instance or occasion.

5.2 Managerial implications

Platform strategy is frequently used by industrial companies to facilitate innovations and add more value to inter-firm collaboration networks. This article shows clearly the strategy options for leveraging platforms and reminds managers to nurture the platform strategy by following the stages of value co-creation. Moreover, the article offers a framework that guides managers to reach the ideal set of platform-based business models.

Based on the case study, this study shows the motive, the practices of value co-creation and the focus of the process in platform-based business models. Our study suggests that in incremental innovation (i.e., PI and TI logic), the value co-creation practices are more focus on the materializing stage. And in radical innovation (i.e., PR and TR logic), the emphasis put on the linking stage. These findings could help companies to alter their strategy. For instance, companies could benefit from rich joint ideations and problem solving among the networked actors, as they shift the focus in linking stage when they start a new business.

Finally, this study identifies the start point and three distinct transition routes across the platform leverage logics: 1) Starting from offering standard products; 2) plus customer-centric offerings; 3) plus value-adding service; and 4) plus integrated personalized solutions. For managers, this study will be inspiring as it shows the challenges that companies face embarking on any of the trajectories. The identified trajectories might act as a strategic choice model. Managers should check if their companies or business units are proficient enough in terms of diverse customer-oriented attitudes, project key management skills, and technical systems skills.

5.3 Limitations and suggestions for future research

Building on the theoretical reasoning and qualitative research, this article provides novel insight into how manufacturers are using platform approaches to co-create value in the age of Industry 4.0 / IIoT, but it cannot claim generalizability given its interpretive method.

Second, this study focus on the practice that the key firm leverage the platform for enhanced value co-creation. When managing a platform business, a firm needs dynamic capabilities. Future research needs to identify the specific capability necessary for manufacturers to control the platform and sustain the co-created value.

Third, though we selected companies from China's textile manufacturing industry as case illustrations, the use of platform methods can certainly be found in other industries as well. Investigating cases from other industries could well lead to different trajectories and dynamic value co-creation practices being discovered, providing further valid contributions to the literature.

Last, value co-creation process is dynamic and iterative in nature. We suggest the longitudinal method which allows mapping and explaining simultaneous changes of value co-creation within companies. The longitudinal approach is considered particularly suitable to investigate process change in inter-firm platform settings and to uncover learning processes.

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