DIGITAL SERVITIZATION: STRATEGIES FOR HANDLING CUSTOMIZATION AND CUSTOMER INTERACTION

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1. INTRODUCTION

Balancing customization and standardization is likely enabled through modularity for production as well as service companies (Aas & Pedersen, 2013; Bask, Lipponen, Rajahonka, & Tinnilä, 2011; Hellström, Wikström, Gustafsson, & Luotola, 2016). Achieving such a balance is a key challenge for manufacturing firms when servitizing. Research on manufacturing firms' interactions with their customers as they pursue servitization strategies has focused on different forms of customer engagement (Carlborg, Kindström, & Kowalkowski, 2018) and customizing solutions (Jagstedt, Hedvall, & Persson, 2018). Customer centricity is suggested to be a core property for services, which are essentially co-created (e.g. Vargo & Lusch, 2008). Moreover, research has emphasized the role of managing information when pursuing a balance between customization and standardization (Cenamor, Rönnberg Sjödin, & Parida, 2017; Hellström, 2014). At the same time, recent service theory has departed from emphasizing heterogeneity as a key services criterion, as new digital technologies provide opportunities for increased mass adaptation and standardization (e.g. Sawhney, 2016).

Overall, the digital servitization trend, understood as the use of digital tools to move from a product-centric business model to a service-centric one, is strengthening, which has significant implications for business model innovation (Kohtamäki, Parida, Oghazi, Gebauer, & Baines, 2019; Paiola & Gebauer, 2020). Digital servitization particularly enables effective value creation (Kohtamäki et al., 2019); although customers expect customization, manufacturing firms work toward standardization, increasing efficiency and capturing value. In the servitization literature, services are often treated as

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a homogenous group of offerings; in contrast, we believe that different digitalization processes and outcomes can be expected depending on the type of service. Therefore, it is time to take stock of recent developments in digital servitization and discuss and conceptualize the implications of digitalization for different types of services, with a focus on the tension between customization and standardization on the one hand and the degree of customer interaction on the other. Hence, we ask the following research question: How does digitalization enable firms to balance standardization and customization when they co-create value with customers?

This conceptual chapter was motivated by an empirical study of five manufacturing firms in the oil and gas industry at different stages of servitization. We use insights from this study to illustrate our main arguments (Siggelkow, 2007).

We continue by defining key concepts in service customization by categorizing industrial services and digitalization. Then, we present various types of industrial service offerings and typologies for their classification. Thereafter, we describe associations among customer interaction, customization, digitalization. and different types of industrial service, with an overview of the digital technologies used in servitization. Finally, we discuss the strategic implications of this work for servitized firms.

2. THEORY DEVELOPMENT

2.1. Standardization, customization and customer interaction

Standardization relates to the pursuit of economies of scale; it is based on the logic that the more you make of something, the more you save in standardizing both the process and the output. However, competitive advantage derives not only from operational excellence and low-cost production (Porter, 1996) but also from differentiation and more careful customer orientation, which results in a huge interest in mass customization (Davis, 1987). A recent literature review found that one key value creation process of servitizing manufacturers is to customize the offering (Garcia Martin, Schroeder, & Ziaee Bigdeli, 2019). The central idea underlying mass customization is the pursuit of meeting specific customer needs at near-mass-production efficiency. Hence, mass customization remains

relevant for servitizing manufacturers. A few studies have addressed this from the perspective of achieving balance, seeing modularity as the enabler (Bask et al., 2011; Hellström et al., 2016). It is, however, clear that digitalization also constitutes an enabler in achieving such balance in service provision, for example, through platforms (Cenamor et al., 2017).

Therefore, this study seeks to understand how customers participate in digital service provision using two dimensions: the degrees of standardization/customization and customer interaction (e.g. Consoli & Elche-Hortelano, 2010; Hansen, Nohria, & Tierney, 1999; Larsson & Bowen, 1989; Løwendahl, 2005; Maister, 1993; Ramírez, 1999; Schmenner, 1986). Standardization refers to the reduction or elimination of customized, one-time, seldom-used solutions that involve variability, added costs and quality problems. Customization refers to tailoring offerings to meet customers' specific needs; its varying degrees run along a continuum ranging from customized to standardized services, depending on the extent to which a service can be codified and delivered (Hansen et al., 1999; Løwendahl, 2005; Maister, 1993).

The degree of customer interaction refers to the extent of customer involvement in the provision of an offering. A common understanding is that services are co-produced through interaction between customers and service providers (Amara, Landry, & Doloreux, 2009; Bettencourt, Ostrom, Brown, & Roundtree, 2002) and that their quality is evaluated when the service is used (Normann, 1984). However, this conceptualization needs to be nuanced (Breunig, Kvålshaugen, & Hydle, 2014; Grönroos, 2011). Services are sometimes created in collaboration with customers, with simultaneous provision and consumption; customers are not always involved, however, such as when service providers receive orders from customers and then deliver the requested services. In this vein, Kvålshaugen, Hydle, and Brehmer (2015) identified four generic types of services: standardized-provided, standardized–co-produced, customized-provided and customized–co-produced. Indeed, servitization is changing the buyer-supplier relationships toward the use of more relational business

practices, and digitalization provides means (e.g., through efficient knowledge-sharing routines) to master this change (Kamalaldin, Linde, Sjödin, & Parida, 2020). Moreover, digital service innovation

may develop incrementally through agile co-creation processes that are typical in software engineering (Sjödin, Parida, Kohtamäki, & Wincent, 2020).

The relationship between standardization/customization and customer interaction is a powerful construct for understanding servitization as it aids in identifying how companies can manage their industrial services and interact differently with their customers. However, different types of industrial services may require different degrees of customer interaction.

2.2. Industrial service types

There are various service classifications. Baines and Lightfoot (2014) suggest a classification that catches the role of the customer: based on customer profiles, industrial services (i.e., those provided by manufacturers) are classified as basic (for "do-it-yourself" customers), intermediate (for customers who want manufacturers to do it with them) and advanced (for customers who want manufacturers to do it for them). In this classification, it is mainly the advanced services that are delivered by deploying information and communication technologies (Baines & Lightfoot, 2014). Another framework based on this classification is the servitization pyramid, with a horizontal dimension regarding service focus that distinguishes between product focus versus customer process and a vertical dimension exposing value proposition that distinguishes between input, performance and results (Coreynen, Matthyssens, & Van Bockhaven, 2017).

However, for this analysis, the more fine-grained classification of Partanen, Kohtamäki, Parida, and Wincent (2017) is used. It consists of five categories (pre-sales, R&D, operational, product support and product lifecycle services), each with sub-categories, resulting in a total of 15 distinct types of industrial services (see Table 1). This classification is useful for the operationalization of servitization efforts when services are changing due to digitalization. For example, the existing industrial service "technical user training" (a product support service) may become location-independent when assisted by virtual-reality (VR) technology. However, to fully grasp what digital servitization is about, we need to look at the characteristics of the digitalization.

2.3. Characteristics of digitalization

There are basic characteristics of digital technology that can be used as a foundation for understanding how digitalization enables servitization. Zuboff (1985) seminal work exposes how information technology facilitates moving from industrialism to knowledge-based societies through “automating” and “informating”. Automating is about using information technology to automate tasks and reproduce human skills, providing precision and uniformity in production. When automating activities, data are registered by the equipment or machine. The term “automating” is highly relevant in servitization since many service provisions are time-consuming and repetitive, such as (condition) monitoring and fault detection. In contrast, informating refers to the process that translates descriptions and measurements of activities, events and objects into information that becomes visible to the employees and that may be relevant for decision-makers. Informating can be an unintended result of computer-based automation, but it can also be a conscious decision designed to obtain and exploit information that can be used in business, such as improvement and innovation of products and services (Zuboff, 1985, p. 8). Informating in relation to servitization reflects the possibility of using data generated through automated or digitalized service processes to improve and further capitalize on the service.

Automating and informating represent two facets of digital work, while interactive (collaborative) aspects of it may be conceptualized through notions of digital representing and mediating (Jonsson, Mathiassen, and Holmström (2018). Digital representing emphasizes content and “how IT is used to monitor and produce digital content” (Jonsson et al., 2018, p. 218), while digital mediating emphasizes the medium and “how IT can be used for digitally mediated cooperative work” (Jonsson et al., 2018, p. 218). Digital representing and mediating highlight two ways that digital technology may be used by servitized firms. Jonsson et al. (2018) use the example of a condition-based maintenance service, where representing may refer to information that can be obtained from the monitored machine and where mediating may refer to how technology is used when maintenance workers and/or data analysts collaborate.

In the following, we will use the concepts of automating and informating to highlight the basic characteristics of digital technology, while representing and mediating are key characteristics of how digital technologies are implicated in work practices when exposing digital processes undertaken by the services. According to the service-dominant logic, customers are co-creators or producers of value (Vargo & Lusch, 2008). How this co-production happens (in terms of customization/standardization and customer interaction) as services become increasingly digital and involve automating, informating, representing and mediating has not been conceptualized to our knowledge.

2.4. Degrees of customization and customer interaction in industrial services

By mapping different industrial service types (Partanen et al., 2017) onto Kvålshaugen et al. (2015) juxtaposition of the degrees of standardization/customization and customer interaction, a clear pattern emerges (Figure 1). Overall, most industrial services involve high degrees of customer interaction and customization. Operational, product support and product lifecycle services are customized and co-produced; interaction with customers during service performance is important, and solutions and outcomes are tailored to specific customer needs. Repair services for equipment on an oil rig may serve as an example: The customer, who may be the rig operator, calls the supplier's 24-hour call center, describes the issue and asks for help. Representatives of the customer and the supplier engage in a point-to-point sale for the repair work, which may take a few hours or up to 4 weeks. When the customer agrees to the repair service, a service engineer is flown to the rig to repair the product; they explain the problem to the rig staff and demonstrate how to deal with it in the future. The rig employees thus learn from the service engineer during this visit.

Pre-sales services are more standardized (i.e., not individually customized) but involve a high degree of customer interaction, for example via product demonstrations and seminars attended by potential and existing customers. Most R&D services are customized-provided (involving a high degree of customization with less customer interaction), except for feasibility studies, which are typically tailored to customers' strategic needs and performed in close collaboration with customers or their representatives. Only sub-categories related to warranties and spare parts are standardized-provided.

FIGURE 1 ABOUT HERE

Figure 1 Degree of customer interaction and customization of different industrial services.

2.5. Impacts of digitalization on customization and customer interaction in industrial services

Industrial services are changing drastically through digital servitization. The use of digital technology in relation to products such as the internet of things (IoT) (including sensors), virtual reality (VR), artificial reality (AR), robotics and automation completely alters services, their outreach and provision (Parida, Sjödin, & Reim, 2019). Returning to the example of repair services on an offshore oil rig, digital technologies enable the manufacturing firm to run a proactive rather than reactive support center, with engineers using digital monitoring (which covers all on-rig operations) to remotely detect errors and digital tools such as digital twins to find potential solutions. When a repair job must be performed by someone physically present on the rig, AR can be used to guide the rig crew, eliminating the need to dispatch an engineer from the manufacturer. In our empirical study, we identified cases in which the application of digital technology reduced the time spent performing repair jobs on offshore rigs from 4 weeks to 1 hour. This example involves customer consultation through the product support center and product lifecycle and repair services. Digital technology transforms product lifecycle services to standardized–co-produced or even standardized-provided services, with a low degree of customization and a low to high degree of customer interaction, depending on the type of technology used.

Digitalization also changes other service types, perhaps with the exception of R&D services. Product support services use mainly data analysis and the IoT and are customized with little customer interaction. Pre-sales and operational services involve simulations, automation and proactive support; these are standardized-provided services with low degrees of customer interaction and customization. Thus, digitalized industrial services tend to be standardized-provided, and fewer are customized–co-

produced (Figure 2). Technology is the driver of digital industrial services, as addressed in the next section.

FIGURE 2 ABOUT HERE

Figure 2 Degree of customer interaction and customization for digital services.

2.6. Digital technologies used in industrial service customization and customer interaction

Different digital technologies give rise to different customization and interaction patterns (Figure 3.). IoT technologies (i.e., sensors) provide companies with huge amounts of data that can reduce customer interaction while enabling more service customization. Using the basic characteristics of information technology, data through IoT that reduces customer interaction and enables customization relates to the process of informating. However, robotics, VR and AR are associated with low degrees of customization. Robotics relates to the process of automating, where information technology is used to automate tasks and mechanically reproduce human skills. In contrast, VR is a way to implicate digital technology in work practices, where the content is important, as in digital representing. Finally, AR, in addition to representing content, is also about the medium used for cooperative work, as in digital mediating. AR, but not VR or robotics, appears to enable a high degree of customer interaction. For example, a rig crew can perform maintenance on a product such as a ventilator with direction from a servitized firm's service center staff via AR. Thus, the use of IoT technologies leads to the provision of customized-provided services through informating processes, whereas AR is associated with standardized–co-produced services through mediating processes; VR enables representing services; and robotics use automating processes associated with standardized-provided services (Figure 3). No technology seems to lead to high degrees of customization and customer interaction, which may indicate that these services require value co-creation with customers, in which digital technologies enable the communication, while the real value lies in the interaction (Grönroos, 2011; Løwendahl, 2005). The servitization literature exposes that interaction for value co-creation may be increased in breadth and depth through digitalization capabilities such

as intelligence, connectivity and analytics (Lenka, Parida, & Wincent, 2017). Following these complementary insights, digitalization capabilities are necessary for value co-creating with customers.

FIGURE 3 ABOUT HERE

Figure 3 Degree of customer interaction and customization for different digital technologies.

This conceptual analysis suggests that industrial digitalized service provisions enable firms to shift from: i) customized–co-produced to standardized-provided services and representing and automating services; ii) customer interaction to increased customer knowledge; and iii) servitization to the professionalization of services and further development of customized–co-produced services. Table 1 shows the shift and the whole range of traditional and digitalized industrial services according to the degree of standardization/customization and customer interaction.

Table 1 Degrees of standardization/customization and customer interaction for traditional and digital industrial services

TABLE 1 ABOUT HERE

3. DISCUSSION

We set out to answer the following question: How does digitalization enable firms to balance standardization and customization when they co-create value with customers? Drawing on the framework of Kvålshaugen et al. (2015) combined with theories on servitization and digitalization, we have conceptualized the implications of digital servitization on the degree of customization and standardization of services and customer interaction. Our conceptualization suggests that different digital technologies have different impacts on customization and customer interaction according to service type (Figures 1 and 3, Table 1). With digitalization, many of Davis's (1987) ideas on mass customization are becoming a reality. The idea of mass customization builds on what could be termed "economies of customer interaction" (Piller & Möslein, 2002). Therefore, we further classified

different technologies' relationships to service types in terms of customer interaction (Figures 2 and 3, Table 1).

3.1. Theoretical contributions

Servitization can strengthen companies' performance (Aas & Pedersen, 2011) and competitiveness, especially in the long term (Visnjic, Wiengarten, & Neely, 2016); however, the transition from products to services is very challenging (Alghisi & Saccani, 2015), as it entails a shift in logic (Wikström, Hellström, Artto, Kujala, & Kujala, 2009). Product-oriented businesses are often characterized by standardized, homogeneous solutions and volume production, whereas more service-oriented companies are characterized by heterogeneous, specialized knowledge–intensive delivery (Fisk, Brown, & Bitner, 1993), often customized to individual customers' needs.

Industrial services have traditionally been delivered for specific needs and have involved intense customer interaction (i.e., customized and co-produced). However, our conceptualization indicates that the digitalization of these industrial services involves a shift in logic. We argue that digital technology paradoxically enables service standardization (and higher-volume production) with less customer interaction as these technologies increasingly replace human interaction through the processes of automating and representing (Jonsson et al., 2018; Zuboff, 1985). The figuration of mediating, however, enables new forms of collaboration that involve standardization with high customer interaction. Moreover, the process of informating increasingly comes into play and simultaneously creates more data and knowledge about customers. We contend that servitized companies utilize a kind of economy of interaction (Piller & Möslein, 2002), not in the sense of interaction frequency or volume but in terms of appropriate data collection and smart data analysis.

To harness customer data from sensors and the IoT, servitizing companies build analytical capabilities and new knowledge bases that can be used strategically to (further) enhance (new) services. This process implies that digitalized services are characterized by standardized solutions, as are products, but also by detailed, customized, mass-adapted delivery to customers. For example, data analytics can

yield detailed information about a drilling crew's performance relative to that of other crews on the same oil platform (or other platforms) in a translational process in which measures of activities, events and objects have become information. Such informating processes (Zuboff, 1988) involve how micro-data can be used to scale the analytics down to the product level or aggregate them up to the crew, organization, rig or even geographic region level.

Thus, digital services are characterized by the provision of standardized solutions that are not only informating but also representing and mediating. Our main contribution to the servitization literature is that we demonstrate how industrial services shift from customized and co-created to mainly standardized-provided and informating when digitalized. Classically, customized–co-produced services are related to professional services, in which experienced and knowledgeable professionals employed by service providers work closely with customers to co-create solutions (Løwendahl, 2005; von Nordenflycht, 2010). The development and enhancement of such professional services may be the next step for servitized manufacturing firms to address future customer-related challenges. Although these firms will then compete with other service firms, they may have a competitive advantage, given their product-related knowledge. Future studies of digital industrial services should closely examine the evolving professionalization of servitized firms.

3.2. Managerial implications

This chapter can aid managers of servitized manufacturing firms who wish to utilize digital technologies in their service provision. These complex changess go far beyond the technological dimension and should be managed wisely. The conceptualization advocated in this chapter may help firms know how to develop insight and knowledge about their customers based on collected data rather than on in- teraction, while retaining interaction between customers and the manufacturers' installed base of products and systems. Just as manufacturers shift to new knowledge bases when initiating servitization (Davis, 2004), further enhancement of knowledge about customers via data collection manifests

their positions and potentially enables further value stream migration. The conceptual models presented in this chapter may serve as guiding frameworks for managers responsible for transformations that move their firms toward digital servitization.

4. CONCLUDING REMARKS

Our analysis suggests that digital technologies influence industrial services and opportunities for customization and customer interaction, thereby extending extant knowledge (e.g. Sawhney, 2016) on opportunities for increased mass adaptation and standardization of services in the context of servitization. The dimensions of standardization and customization for industrial services are almost the opposite when these services are digitalized. The use of digital characteristics exposes the digital processes underlying these services: Informating, automating and representing expose low customer interaction, while mediating represents high customer interaction; however, informating exposes customized services, while automating, representing and mediating expose standardized services.

Future studies could examine the transformation of customer interaction into customer knowledge through informating services. How service firms increasingly practice high customer interaction through mediating is another important future research area. An issue that should be addressed carefully is the question of who owns customer data and the resulting customer knowledge, which are becoming the new trading goods.

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