

## A Value Architecture Perspective of Product Service Software Systems

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Product companies continue to struggle with transitioning from product-centric to servitized business models delivering product-service-software systems (PSSS). While the literature on digital servitization continues to grow, practitioners gradually infusing their business with servitized and digitized elements are still keen to understand the underlying value creation and delivery. Our study examines the complex dynamics of PSSS value architectures in light of existing value networks. Combining a longitudinal single case study spanning over three years in the construction industry with a cross-industry multiple case study approach, we collect insights from product companies, value network actors such as distributors, and customers. In an interdisciplinary approach, we integrate marketing and channel management perspectives to derive collaboration archetypes to deliver PSSSs in existing value networks and address the question of which player can contribute to the value proposition in which way. For managers, this study offers an overview of relevant change drivers shaping PSSS value architectures and their implications on essential capabilities and processes.

*Keywords:* Servitization, IoT, Product-service systems, value architecture, supplier relations, channel management, distributor, value network

### Research Motivation

In today's fast-moving world, megatrends such as digitization and servitization reshape international value creation and delivery – intensifying global competitive pressure and shifting market and even company boundaries. Hence, companies are forced across industries to challenge traditional product-oriented business models seeking innovative value-generating opportunities. Under those circumstances, product-service-software systems (PSSS) offer intriguing paths to creating resilient businesses.

Within the past centuries, the knowledge of servitized business models evolved into a well-established research field. Especially in the light of emerging technologies and the COVID19 pandemic, interest in possibilities enabling remote digital services continues to grow. Although existing literature offers broad insights into the desirability of PSSS, many manufacturers

continue to struggle to implement PSSS value architectures in practice. In past research efforts, the role of software and digitalization in servitization was underestimated (Coreynen, Matthyssens, & Van Bockhaven, 2017), so that researchers and practitioners alike are keen to fully understand the practical design, development, management, and marketing of PSSSs (Kindström & Kowalkowski, 2014).

While most exploratory research investigated servitized value constellations under the implicit assumption of direct relations between the provider and the customer, a parallel research stream investigating PSSSs delivery in the context of complex ecosystems emerged. However, to the best of the authors' knowledge, until today, common product companies' value structures building on distribution partnerships has been mostly neglected in PSSS literature. Filling this blind spot, we raise the following overarching research question:

*How can the value architecture for PSSS be designed between product companies, distribution partners, and customers?*

This study focuses on established product companies transforming their business models and investigates servitized value architectures in the context of existing product-oriented business models and value networks. Transitioning towards PSSSs entails a purposeful adaption of the complete value constellation. In practice, companies are often confronted with a business model duality instead of entirely betting on a fundamental shift. Especially large manufacturing firms hesitate to radically replace goods sales with PSSSs but instead choose to “infuse” servitized business models into their existing sales approaches (Ulaga & Reinartz, 2011). This gradual shift entails many challenges, such as balancing potentially contradicting business models with diverging value creation logics. Especially manufacturers typically relying on indirect sales through channel intermediaries face the challenge of aligning all sales initiatives with their existing distribution network to avoid conflicts.

### **Contribution to Theory and Practice**

With this study, we follow the call for a better understanding of the implementation of PSSSs (Adrodegari & Saccani, 2017; Baines et al., 2017; Reim, Parida, & Örtqvist, 2015) and contribute to the rising research body on the transition towards PSSSs (Kohtamäki, Rabetino, Einola, Parida, & Patel, 2021). More specifically, we address the research gap on manufacturers' capabilities in PSSSs required to elaborate value creation and delivery jointly with distribution partners by channeling competitive advantages through digital and strategic capabilities and the reconfiguration of resources and processes (Kohtamäki, Parida, Oghazi, Gebauer, & Baines, 2019, p. 385).

This study addresses the overarching research problem of PSSS value architectures by large product companies shifting from product-centered business models towards PSSSs. Following the research efforts on adapted organizations, sales processes, and capabilities when transitioning towards selling PSSSs (Oliva & Kallenberg, 2003, p. 167; Ulaga & Reinartz, 2011), we plan to extend this understanding to selling PSSS offerings. This study shall lead to a detailed knowledge of the capabilities required for effective PSSSs sales and, hence, contribute to feasible value delivery. To tackle this complex problem, we integrate insights from the marketing discipline such as channel management and value proposition design and delivery. Such an interdisciplinary approach allows us to address the issue beyond the scope of the servitization discipline (Wagner et al., 2011).

The following sub-research questions address the overarching problem of PSSS value architectures in existing value networks:

- (1) Why are value architectures changing?
- (2) How does a business model transition from product to PSSS sales affect the *value network*?
- (3) How does a business model transition from product to PSSS sales affect *value creation and delivery*?

### **Methodology**

The methodology is of dual nature and combines a longitudinal single case study with a multiple case study approach. Over three years, we will examine a reference case of a product-oriented power tool manufacturer to understand the value architecture in-depth. Addressing common single-case study shortcomings such as limited transferability and generalizability, an additional analysis of multiple cases in the agriculture and automotive industries broadens the database and increases the findings' overall validity (Eisenhardt & Graebner, 2007; Stake, 2013). The qualitative data will be collected in semi-structured expert interviews, workshops, and focus group discussions. While most qualitative servitization research currently focuses on the producing perspective only, this research applies a three-fold focus collecting insights from the manufacturer, vital value network actors such as distributors, and customers.

### **Expected Results**

Corresponding to the research questions, the expected results will serve three purposes. First, we want to understand which trends shape PSSS value architectures and networks. Applying perspectives from marketing and channel management practices, we contribute to theory and practice with an overview of relevant change drivers and their implications. Second, we plan to identify different network collaboration archetypes which can be applied to successfully deliver PSSS in existing distribution structures. Building on fundamental channel concepts, we investigate shifting channel competencies, related requirements, and key capabilities. Third, the research aims to consolidate the findings into a transferable and maybe even generalizable understanding of the value architecture of PSSS, including essential capabilities in value creation and familiar patterns of the value delivery within the value network. This understanding shall apply to related operating processes, capabilities, resources, and partnerships.

**References list**

- Adrodegari, F., & Saccani, N. (2017). Business models for the service transformation of industrial firms. *The Service Industries Journal*, 37(1), 57-83. doi: 10.1080/02642069.2017.1289514
- Baines, T., Bigdeli, A. Z., Bustinza, O. F., Shi, V. G., Baldwin, J., & Ridgway, K. (2017). Servitization: revisiting the state-of-the-art and research priorities. *International Journal of Operations & Production Management*.
- Coreynen, W., Matthyssens, P., & Van Bockhaven, W. (2017). Boosting servitization through digitization: Pathways and dynamic resource configurations for manufacturers. *Industrial Marketing Management*, 60, 42-53. doi: <https://doi.org/10.1016/j.indmarman.2016.04.012>
- Eisenhardt, K. M., & Graebner, M. E. (2007). Theory Building From Cases: Opportunities And Challenges. *Academy of Management journal*, 50(1), 25-32. doi: 10.5465/amj.2007.24160888
- Kindström, D., & Kowalkowski, C. (2014). Service innovation in product-centric firms: A multidimensional business model perspective. *Journal of Business & Industrial Marketing*.
- Kohtamäki, M., Parida, V., Oghazi, P., Gebauer, H., & Baines, T. (2019). Digital servitization business models in ecosystems: A theory of the firm. *Journal of Business Research*, 104, 380-392. doi: <https://doi.org/10.1016/j.jbusres.2019.06.027>
- Kohtamäki, M., Rabetino, R., Einola, S., Parida, V., & Patel, P. (2021). Unfolding the digital servitization path from products to product-service-software systems: Practicing change through intentional narratives. *Journal of Business Research*, 137, 379-392. doi: <https://doi.org/10.1016/j.jbusres.2021.08.027>
- Oliva, R., & Kallenberg, R. (2003). Managing the Transition from Products to Services. *International Journal of Service Industry Management*, 14, 160-172. doi: 10.1108/09564230310474138
- Reim, W., Parida, V., & Örtqvist, D. (2015). Product–Service Systems (PSS) business models and tactics – a systematic literature review. *Journal of Cleaner Production*, 97, 61-75. doi: <https://doi.org/10.1016/j.jclepro.2014.07.003>
- Stake, R. E. (2013). *Multiple case study analysis*: Guilford press.
- Ulaga, W., & Reinartz, W. J. (2011). Hybrid offerings: How manufacturing firms combine goods and services successfully. *Journal of Marketing*, 75(6), 5-23. doi: 10.1509/jm.09.0395
- Wagner, C. S., Roessner, J. D., Bobb, K., Klein, J. T., Boyack, K. W., Keyton, J., . . . Börner, K. (2011). Approaches to understanding and measuring interdisciplinary scientific research (IDR): A review of the literature. *Journal of Informetrics*, 5(1), 14-26. doi: <https://doi.org/10.1016/j.joi.2010.06.004>