

## Introduction to the Data-driven Services in Manufacturing Minitrack - Exploring Management, Engineering, and Organizational Transformation

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Manufacturing firms are currently permeated by two global macrophenomena: servitization and digitalization respectively Industry 4.0 [1], [2]. The concept of servitization on the one hand describes the addition of value to core corporate offerings through services [3]. The motivation of manufacturing companies to servitize is generally based on competitive, demand-based, and economic reasoning [4]. Concrete reasons are, for example, the reaction to outsourcing trends, the saturation of markets, or the commoditization of products [5]. The service business of manufacturing companies is traditionally structured around their core products and focuses on personnel-intensive services such as consulting or maintenance.

Digitalization on the other hand represents a broader socio-technical phenomenon of adopting and using digital technologies in individual, social, and organizational contexts [6]. Integrating digital technologies and computing with physical processes leads to the concept of cyber-physical systems [7], which represents a physical object, that is connected to other systems through global or local networks [8]. Porter and Heppelmann speak of smart, connected products in this circumstance [9].

Especially capital-intensive products (e.g., tooling machines) are increasingly permeated by information and communication technologies. This enables them to generate and collect large amounts of usage, condition, and context data [10], which, in turn, extends the design space for service innovations quite significantly for manufacturers [11]. The resulting data-driven service innovations, which are built upon a physical product as a data provider, are widely coined as smart services [12].

While smart services are especially important in manufacturing, the concept of data-driven services goes even further; they encompass *“the use of data and analytics to support the decision-making process of the customer via data and analytics-based features and experiences in form of a stand-alone offering or bundled with an existing product or service”* [13].

But, as of today, manufacturing companies still struggle to engineer innovative data-driven services. These kinds of services differ strongly from the established businesses in manufacturing – from the service businesses as well as the product businesses [14]. Manufacturing companies need new tools and approaches to manage and engineer data-driven services. Furthermore, new processes, structures, and competences are needed to provide them. Therefore, a transformation of the whole business is necessary.

Recognizing these challenges, this minitrack aims to explore insights on multiple facets of data-driven services in manufacturing.

Four papers were selected for this year’s mini-track after extensive peer-review. They offer valuable insights into data-driven services in manufacturing. The papers are introduced briefly in the following:

The first paper by Kreyenborg, Eichholz, Hefft, and Azkan is titled *“Emphasizing a Service Phase Perspective for Machine Manufacturers Seeking Digital Servitization - a Taxonomy for Industrial Service Phases”*. Based on a literature review and expert interviews, the authors introduce a taxonomy for digital services, that emphasizes the relevant service phases. The application and usefulness are demonstrated within a case study [15].

Jaspert and Ebel present a paper titled *“Settings of Organizational Adjustments due to Digital Servitization”*. The contribution deals with the impact of smart service innovation on the organizational structures of manufacturing companies. The authors conducted a qualitative template analysis involving 13 German manufacturing companies. Their research results in five settings of adjustments in the organizational structures of the investigated firms [16].

The third paper is titled *“Digital servitization: How data-driven services drive transformation”*. The authors Kowalkowski, Tronvoll, Sörhammar, and Sklyar carried out a longitudinal in-depth single case study to understand the ability of companies and networks to digitalize their service operations. From their

observations, they conclude that firms must foster service-centricity and execute strategic change projects for the internal organization as well as the broader ecosystem. Hereby they have to consider three interlinked transformations on the digital, organization, and ecosystem levels [17].

The fourth paper by Strack, Frank, Stich, Lenart, and Pfau is titled “*Sociotechnical Implementation of Prescriptive Maintenance for Onshore Wind Turbines*”. It addresses the introduction of a certain smart service into the wind turbine value chain. Based on interviews with five case companies, success factors for the implementation of prescriptive maintenance are derived. They are then structured along the areas of the acatech Industry 4.0 maturity index [18].

We think that the papers will add to the knowledge base on digital services in manufacturing in the long term. Furthermore, they give managers and practitioners valuable orientation for steering their companies through the shallows of digital servitization.

We hope you will enjoy the papers as much as we have, and we congratulate and thank the authors for submitting such valuable insights. We would also like to thank the reviewers for their comprehensive work, which helped in the further development of the paper.

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