

# The Digital Supply Chain of the Future: Technologies, Applications and Business Models Minitrack

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## Abstract

*The following paper describes the mini-track on the digital supply chain of the future. After an introduction to the topic the different papers are addressed and integrated into an overall context. At the end of the text we added some recommendations concerning future research on the digital transformation of companies, business models and supply chains.*

## 1. Introduction

After decades of relative stability it seems that the cost-cutting and problem-solving potential of the lean philosophy reaches its limits in many supply chains. Today, the economic environment is changing rapidly. Supply chains have to cope with increasingly dynamic customer demands and a broad variety of external disturbances. More flexibility and agility are needed, processes have to be accelerated and made transparent or visible in order to enhance supply chain responsiveness. Smart products in combination with innovative data-driven supply chain services pave the way for a paradigm shift in supply chain management, leading to more self-organizing and self-optimizing systems. Due to the inherent transfer of decision-making processes to the product itself, a product-centric view is necessary. In this minitrack we focus on how smart products and cyber-physical systems in combination with mobile and cloud computing, digital social networks, and big data analytics can contribute to the digital supply chain of tomorrow. In addition, the impacts of digitization efforts on firms and supply chains are considered from a management and business perspective.

Digitization in general is expected to play an increasingly important role for global supply chains. The reasons for this include the shift in values from the physical artefact to the data created by smart products, the emerging importance of services, the displacement of industry borders, the radical change of competitive

structures, the transformation of business models and, at the end of the day, the symptomatic creative destruction of established structures and behavior patterns. This minitrack provides an outlet for all research focused on digitization of supply chains, on corresponding applications and emerging technologies.

## 2. Contributions

One of the main challenges of digitalization is managing the transformation process from an existing company to its digitalized equivalent. The first step must be to position the company within a digitalization maturity model. Therefore the aim of the first paper presented in this minitrack “is the scientific development of a maturity model concerning the digital transformation of companies within the manufacturing industry’s supply chain. The rather ‘broad’ and dispersed ‘mega-trend’ of digitalization is expected to play an increasingly important role for companies as well as for the (digital) supply chain of the future. Such a model comprises the objective of addressing fundamental components, complementary innovations and relevant terminologies, like smart products, Cyber-Physical Systems (CPS) and Big Data Analytics. Scientific rigor is achieved through conducting grounded theory research and in-depth interviews as methods of data collection and evaluation. Furthermore, relevant aspects concerning the development and construction of maturity models are discussed, before a suitable and scientifically elaborated maturity model concerning digitalization emerges from the course of investigation and its value for economic practice as well as for the scientific community is specified.” [1]

In case that the position of a company within the maturity model is well-defined managers have to develop their own vision of a digitalized version of the company and to agree on a roadmap of digitalization projects. One of these projects might be the optimization of a supply chain using direct digital manufacturing (DDM). In order to shed light on this

topic the second paper presented in the workshop describes whether and how supply chains are impacted by DDM [2]. The researchers are using “a demand supply integration framework to examine direct digital manufacturing (DDM) applications being used to change product delivery to consumers. To test hypotheses, press announcements were collected and analyzed with content analysis. [The researchers] find that, of the implementations of DDM for delivering products to consumers using digitization, 61% are demand-side focused innovations, 39% are supply-side focused innovations, and 9% are both demand-supply integrated innovations.”

Another emerging technology, which is important in the context of digitalization, is blockchain. The authors make perfectly clear “that access to customer demand needs to be shared effectively, and product and service deliveries must be tracked to provide visibility in the supply chain. Business process integration is based on standards and reference architectures, which should offer end-to-end integration of product data. Companies operating in supply chains establish process and data integration through the specialized intermediate companies, whose role is to establish interoperability by mapping and integrating company-specific data for various organizations and systems. This has typically caused high integration costs, and diffusion is slow. This paper investigates the requirements and functionalities of supply chain integration. Cloud integration can be expected to offer a cost-effective business model for interoperable digital supply chains. [The researchers] explain how supply chain integration through the blockchain technology can achieve disruptive transformation in digital supply chains and networks.” [3]

Besides the emerging technologies, discussed in the first three contributions, there are also well-established technologies, which drive the digitalization of supply chains. The Internet for example is still a strong driver for connecting manufacturers more or less directly to the customer. A lot of research has been done but there are still gaps to close. The fourth paper in the mini-track contributes in this respect. “Returns management [...] is a key aspect of online retailers’ business models. Despite increasing interest in this issue, only a few studies have published empirical results on the drivers of consumer returns in e-tailing. As this knowledge is essential to enable better decisions about return flows, [the researchers] explored an extensive dataset from an online apparel retailer using linear and logistic regression models. This approach distinguishes [the] study from other empirical work, which is usually based on survey methods. Before the data analysis, previously untested hypotheses were formulated using established theories and anecdotal information.” [4]

As well as the 4<sup>th</sup> paper the final one is closing existing gaps. “Combinatorial auctions represent sophisticated market mechanisms that are becoming increasingly important in various business applications due to their ability to improve economic efficiency and auction revenue, especially in settings where participants tend to exhibit more complex user preferences and valuations. While recent studies on such auctions have found heterogeneity in bidder behavior and its varying effect on auction outcomes, the area of bidder behavior and its impact on economic outcomes in combinatorial auctions is still largely underexplored. One of the main reasons is that it is nearly impossible to control for the type of bidder behavior in real world or experimental auction setups. [The authors] propose an agent-based modeling approach to simulate human bidder behavior in continuous combinatorial auctions and demonstrate the validity of our developed agents by replicating human bidder behaviors observed in experimental combinatorial auctions. [They] leverage [their] agents to simulate a wide variety of competition types, including experimentally unobserved ones that could not otherwise be studied. The capabilities of the proposed approach enable more comprehensive studies [...] of bidding behavior in the complex and highly dynamic decision environment of continuous combinatorial auctions.” [5]

### 3. Conclusion

The heterogeneity of the different contributions, that have been described in the last section show that the research field “Digital supply chain of the future – Technologies, Applications and Business Models” is quite broad and can only be scratched during the HICSS 2017. For future research in this field we propose the following topics:

Analytics of industry-related sensor data and social media data; data-driven applications to support the realization of agile supply chains; innovative smart services for the customer based on smart products; mobile solutions for white and blue collar workers; impacts of digitization on decision behavior in industrial companies, effects of product virtualization on supply chains; business models to support smart object based problem solutions; methodologies, models, frameworks to support digital transformation; regulatory, privacy, and security issues with smart products and services; analysis of drivers and barriers for the digital transformation in industry; maturity models for digital transformation in the industrial sector; analysis of digitization strategies in different industrial branches; effects of digitization on

cooperation behavior; relationship between corporate culture and digital transformation; impacts of digitization on organizational, structural and process design; technological trends related to Cyber-Physical Systems; complementary innovations for and architectures of smart product based solutions; impacts of digitization on product and service offerings; relationship between digitization and value creation; impacts of digitization on decision-making structures; impacts of smart products/services on consumer behaviors; cross-country analysis of digitization of products and services.

#### **4. Future Conferences**

The minitrack on the digital supply chain of the future will be carried out the first time during HICSS 2017. The feedback from the scientific community is quite promising. With 9 contributions submitted and 5 contributions accepted we had a good start. We guess that in the coming years the number of contributions will grow. We suppose that digitalization will become

one of the major research topics for the supply chain management community in the future.

#### **5. References**

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