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Systematic Consideration of Value Chains with Respect to the Timing of Individualization

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Abstract

Increasing variety of customer requirements and product variants lead to extended complexity in development and manufacturing. Especially the management of development and manufacturing with respect to customer specific and individualized products becomes more and more challenging. However, the issue of customer specific and individualized products is often reduced to the strategy of mass customization. The complexity of this topic requires a holistic approach in order to structure and analyze individualization along the entire value chain. Only if such an understanding is created, the issue of individualization can be addressed adequately to meet the increasing flexibility requirements and growing complexity. For this reason, a systematic classification has to be developed to understand the characteristics of and the options for individualization as well as to enable its applicability. Nevertheless, existing approaches are often incomplete and superficial. Furthermore, many terms in the context of individualization are neither defined nor used consistently. Consequently, the aim of this work is to create an overarching systematization that closes the gaps in existing approaches and provides unambiguous terms. Furthermore, this approach should holistically visualize individualization and illustrate its impact to the core value chains in manufacturing industries.

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1. Introduction

Individualization has a great importance in the current development of manufacturing industry. In the course of the fourth industrial revolution, the topic of individualization is increasingly addressed in conjunction with mass customization and production in lot size 1. However, the individualization of products and services is not a new challenge for manufacturing companies. In the middle of the 20th century, the mass production with focus on productivity is affected by the request for more customer-oriented products. This was the beginning of the variant production and at the same time the first form of product individualization in industrial production [23]. The production of different variants enables the customer to select the product which fits most to

his needs. However, since the 1980s there is an increasing heterogeneity of demand and customer requests for individual products [11]. The consequence is a strongly increasing number of variants and eventually the development of the basic idea of mass customization [5]. The increasing flexibility in production through the fourth industrial revolution creates the possibility for an efficient implementation of the mass customization and further modes for manufacturing individualized products. Therefore, the topic of individualization, which has already played an important role in the manufacturing industry over the last few years, gains further significance. Due to both the high relevance and the complexity, a systematical analysis of individualization and creation of a common understanding is required.

2. Product individualization

Product individualization itself is not consistently defined. Admittedly, there are some characteristics describing individualization across several definitions. First of all, there is a certain basic understanding that product individualization intends the targeted satisfaction of certain needs. This includes that individualization requires a specific addressee who is the customer of a product or service. In general, individualization does not necessarily have to be limited to an individual customer, but can also address a customer group. Customer of an individual product or service are end consumers in business-to-consumer (B2C) markets as well as a company in business-to-business (B2B) markets.

A necessary characteristic of individualization is the integration of the customer into the value chain which includes product development, design and production [10]. Based on this definition, there is controversial discussion about where individualization begins. Starting point for this discussion is the variant production in particular. A distinction has to be made between anonymous variant production and the variant production with customer integration.

The variant production in the meaning of an individual production with customer integration consists of an anonymous pre-production and a customer-related end production [6]. The customer is actively involved into the product definition through a configuration process although he is restricted to specific product features and the combination of predefined components in the design of his product.

The anonymous variant production, however, describes the production of variants for defined market segments. For each market segment, a product variant is developed in order to meet the needs of the segment as best as possible. However, the individual variants are generally produced in stock and the individual customer remains anonymous. These are often products for the B2C market like washing machines have a high number of different variants. [10]

There is no active involvement of the customer into the value chain. The only link between customer and the product is the design of the variants basing on the characteristics and requirements of predefined customer segments. As

production is not defined as a kind of individualization in the further considerations.

Furthermore, a specification of the scope of individualization within the value chain of individualized products is necessary. As the non-anonymous variant production shows it is not necessary to involve the customer into the value chain beginning from the first step in product development to create an individualized product. Nevertheless, the possibility of product individualization e.g. in the production process requires a consideration in the development stage. Consequently, the product individualization has an influence on the entire value chain, the integration of the customer albeit can take place at different times.

The degree of individualization of a product depends on the time of including the customer into the value added process that covers the activities along the value chain, and the interaction between customer and supplier. The earlier the customer integration takes place, and the higher the degree of mutual interaction is, the more influence the customer can wield on the product making it possible to meet individual needs and increasing the level of individualization. [11,12]

3. The role of customer order decoupling points in product individualization

The point of time in the value chain of a product at which the product is linked to a specific customer is called customer order decoupling point (CODP). So the CODP divides the value chain into forecast-driven and order-driven activities. [15]. It does not describe the date of the order receipt, but the time at which the customer order is incorporated into the value-added process.

3.1. Basic Classification

In literature, four basic CODPs are specified: Engineer-to-order (ETO), make-to-order (MTO), assemble-to-order (ATO), make-to-stock (MTS) [16,7]. Each of them refers to a main step within the value-added process (see figure 1). Refer to [15]

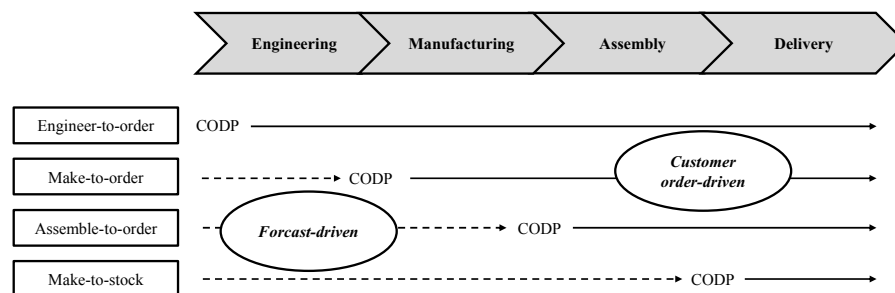


Fig. 1: Basic customer order decoupling points [15]

preferences of an individual customer are not taken into account in this production concept, the anonymous variant

With the exception of MTS, the customer has the opportunity to contribute to the value added process in form

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