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Leveraging the sustainability potential of mass customization through product service systems in the consumer electronics industry

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Abstract

Companies experience an increasing importance for implementing sustainability concerns into their processes and product offerings. In the consumer electronics industry, traditional manufacturing-focused initiatives to minimize the environmental impacts of products are currently still far from satisfactory. The European research project SMC-Excel aims at enhancing the ecological sustainability in the consumer electronics industry through the integration of new business models based on the ideas and concepts of mass customization. In this paper, first insights of the project revealed during a Business Model Innovation workshop are presented. The main hypothesis derived in this workshop – the suitability of product service systems as a lever for the sustainability potential of mass customization – is discussed with the help of an analysis of the state-of-the-art literature on product service systems and mass customization. The paper concludes that the combination of mass customization patterns and product service system patterns carries a significant potential to foster the environmental sustainability of the full business model, but that this potential is highly context dependent. The insights of this paper set up the basis for further empiric research in the consumer electronics industry.

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1. Introduction

Over the last decades there has been a growing awareness of the collective impact of human society on the planetary boundaries. Subsequently, companies are confronted with new requirements for production and experience an increasing pressure to become more sustainable [1, 2]. Hence, business models do not only have to be economically viable but also have to cover certain environmental and social concerns according to the triple bottom line approach [3].

The concept of mass customization (MC) has been discussed broadly in management literature as a viable business model pattern for companies operating in markets that are characterized by high heterogeneity in customer needs [4, 5, 6]. By tailoring products and services according

to the needs of individual customers, firms hope to realize price premiums and increase profits [7]. Subsequently, the concept of MC may serve as a potential pattern of an economically sustainable business model in the context of heterogeneous markets. However, in the light of the ongoing debate on the sustainability of business models as a triple bottom line, the analysis of social and environmental aspects of the MC concept has gained importance. In this context, an increasing number of publications dedicated to the analysis of the sustainability impact of MC can be observed. Thereby, more and more authors claim that MC – besides being an economically attractive business approach – carries the potential to be environmentally beneficial: for example, MC could help to reduce overproduction and resource consumption [8] or could enable more efficient modes of reuse and recycling of products [9, 10]. At the same time, there are only few studies that go beyond

conceptual research and that provide empirical evidence for the beneficial impact of MC [e.g. 11, 12], so that it remains unclear whether the implementation of MC can indeed foster environmental sustainability. In this context, Porabdolloahin et al. [13] state that the realization of an MC strategy will result in various positive as well as negative environmental impact factors, with each of these factors being dependent on the specific MC approach that is chosen.

The European research project SMC-Excel as part of the European Community's Seventh Framework Programme (FP7/2007-2013) within the second call of the ECOINNOVERA Programme aims at enhancing the ecological sustainability in the consumer electronic industry through the integration of a new business model based on the ideas and concepts of MC. Thus, the project has two main objectives: Firstly to develop a new sustainable business model and secondly to assess and prove the potential of MC to foster environmental sustainability.

In this research paper, we present the general context and scope of the SMC-Excel project and outline preliminary results of the first steps of the business model development process. Here, we especially focus on first insights revealed during a Business Model Innovation (BMI) workshop at Vestel Electronics, Manisa. Furthermore, we scrutinize the results of our literature analysis which we conducted to prove the outcomes of this BMI workshop. This literature review addresses primarily the concept of Product Service Systems (PSS) and its relation to the environmental perspective of sustainability. In order to be able to assess the connectivity of PSS to MC, a short literature review has also been conducted for the concept of MC and the general idea of understanding MC as a business model pattern (chapter 3). The conclusion provides answers to the research question, whether PSS has the potential to be a suitable complementary business model pattern to leverage the sustainability potential of MC. The overall aim of this paper is to set up the basis for a future empiric analysis of the suitability of combining the business model patterns of MC and PSS in the CE industry.

2. The SMC-Excel project and its context

The CE market is highly influenced by technological developments. It has changed constantly in recent years through digitalization, innovation and the connection between different devices and systems [14, 15]. Due to these rapid changes, the life cycles of CE products are getting shorter and shorter [16, 17]. Until today, the CE industry is a typical example of mass production. This model raises numerous environmental issues throughout the entire product life cycle: A lack of resource efficient designs of appliances and processes leads to an increased use of raw material – including overproduction – as well as the ongoing use of hazardous materials. A potentially beneficial impact of new technologies is often offset by rebound-effects [18]. Further, CE equipment currently

requires costly processes to perform dismantling and recycling [19]. In addition, off-shore production (mainly in Asian countries) leads to increasing energy demand covered predominantly by coal-fired power stations, and tremendous transportation emissions [18]. Thus, the CE industry can be considered as highly unsustainable.

However, initiatives for integrating environmental concerns into production have taken place in the CE industry for already decades. For instance, multinationals such as Electrolux, Philips and Dow have adopted the aim of enhancing the eco-efficiency of their products since the 1990s [2]. From this time forward the concept of eco-design – defined as “systematic integration of key environmental aspects of a product into the early stages of design and development” [20] – has been put into the center of attention. However, eco-design has its limitations. According to Roy, eco-design is a strategy, which attempts to enhance traditional patterns of production without considering other patterns of need satisfaction [2].

The European Research Project SMC-Excel therefore takes a different approach to enhance the ecological sustainability in the CE industry. The focus of the project is not focused on technological constraints, but rather on the underlying business model. Using the example of TV sets, the project analyses and develops new business model patterns, implementation guidelines, and policy recommendations to enhance the eco-sustainability of TVs. The main focus is put on possibilities to shift the TV's value chain from the current mass production of products with short technology cycles towards an MC of TV sets meeting individual customers' demands.

We will present the general idea of MC and our comprehension of MC as a business model pattern in the following section.

3. Mass Customization as a Business Model Pattern

Even though MC has been discussed for more than three decades in strategic management literature and there are many business cases from different industrial applications available, it is rather difficult to provide a precise definition for the phenomenon. A first definition was provided by Davis [21, p.169], who defined MC as “[reaching] the same large number of customers [...] as in mass markets of the industrial economy, and simultaneously [treating the customers] individually as in the customized markets of pre-industrial economies.” In accordance with this, many authors agree that the idea of MC can be pinpointed to the efficient mass production of customized goods [e.g. 22, 23, 24]. Nevertheless, beyond this rather fuzzy definition, Piller [25, p.314] claims that “the term [MC] is used today for all kind of strategies connected with high variety, personalization, and flexible production.” Also, it has to be noted that research in this field was not able to define threshold values – e.g. for the degree of customization or a minimum sales volume – beyond which a strategic approach

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