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Determinants of consumers' choices and perceived value in mass customization

Empirical studies in the automotive and sports apparel industries

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Preface

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Contents

List of figures

List of tables

List of abbreviations and symbols

ANCOVA	Analysis of covariance
AVE	Average variance extracted
B	Unstandardized regression coefficient
BFI	Big Five Inventory
cf.	confer (compare)
CNFU	Consumer's need for uniqueness
CMV	Common method variance
df	Degrees of freedom
DV	Dependent variable
e.g.	For example
EM	Expectation maximization
etc.	Et cetera
FFM	Five-factor model
H_x	Hypothesis X
i. e.	That is
LU	Lead userness
n	Sample size
M	Mean
MC	Mass customization
NFU	Need for uniqueness
n.s.	Not significant
p	P-value
p.	Page
pp.	Pages
R^2	Effect size
SD	Standard deviation
SE	Standard error
SEM	Structural equation modeling
SQL	Structured Query Language
vs.	Versus
WTP	Willingness-to-pay
α	Cronbach's alpha
β	Standardized regression coefficient
λ	Indicator loading
η^2	Partial eta squared (effect size)
ρ	Pearson correlation coefficient
ρ_{SB}	Spearman-Brown coefficient
χ^2	Chi-square value
ξ	Latent construct

Abstract

Consumers' needs are becoming increasingly heterogeneous. Mass customization is a strategy that caters to these heterogeneous needs while simultaneously keeping the production process efficient. Research demonstrates that mass customization indeed provides increased value to consumers. However, so far little is known regarding how consumers' individual traits influence this perceived value and how consumers make their decisions during the process of customization, which codetermine this increase in value. This dissertation sheds light on these questions.

Besides providing the conceptual foundations of mass customization and an outline of the research methods employed, this thesis consists of three studies that investigate the consumer perspective on mass customization. In part I, consumers' interest in customization is assessed and linked to general personality factors. Part II deals with the choice behavior of consumers and its determinants during customization. In a series of online and laboratory experiments the preferences of the participants during the configuration of automobiles and sports shoes are tested. Finally, in part III consumer-specific antecedents of perceived value in mass customization are investigated by conducting a survey amongst real users of an established mass customization tool used by a global sporting goods brand.

Findings indicate that mass customization is especially an attractive option for both extroverted consumers and those who are open to new experiences. Moreover, it is shown that consumers' choice behavior during customization is influenced by the information about other consumers' choices, leading to diverging choice behaviors. While consumers prefer uniqueness regarding the hedonic attributes of a customizable product, they tend to conform to choices other consumers have made regarding the utilitarian attributes. Additionally, results reveal that mass customization provides increased value particularly to maximizers, lead users, and highly involved consumers, as it increases the product- and process-related benefits for them. However, risks such as cognitive overload need to be considered alongside these benefits, which may result from the variety of options in mass customization for specific consumers. This significantly reduces the likelihood of purchasing the self-designed product.

In conclusion, this dissertation demonstrates the importance of a differentiated view on the real value that mass customization provides. The existence as well as the

extent of the value increase of mass-customized goods compared to the value of standard products is codetermined by the individual characteristics of consumers. Therefore it is important to account for these different needs by *customizing* a mass customization strategy itself to the different consumer segments. These findings have various implications for future research in this field as well as for companies that offer or plan to offer customizable products.

Zusammenfassung

Kundenbedürfnisse werden zunehmend heterogener. Mass Customization ist eine Strategie, die diesen heterogenen Bedürfnissen Rechnung trägt und gleichzeitig die Effizienz des Produktionsprozesses gewährleistet. Ergebnisse aus bisheriger Forschung zeigen, dass Mass Customization tatsächlich einen Mehrwert für Konsumenten schafft. Allerdings ist bisher wenig darüber bekannt, inwiefern die Wahrnehmung dieses Mehrwerts von den individuellen Eigenschaften der Konsumenten beeinflusst wird und wie Konsumenten ihre Entscheidungen während der Produktkonfiguration treffen, die letztendlich diesen Mehrwert mitbestimmen. Diese Dissertation beleuchtet diese Fragestellungen.

Neben einer Übersicht über die konzeptionellen Grundlagen von Mass Customization sowie einem Umriss der verwendeten Forschungsmethoden besteht diese Dissertation aus drei Studien, die Mass Customization aus der Sicht der Konsumenten untersucht. In Teil I wird das Interesse der Konsumenten an Mass Customization untersucht und eine Verbindung zwischen diesem Interesse und generellen Persönlichkeitsfaktoren hergestellt. Teil II behandelt die Auswahlentscheidungen von Konsumenten sowie deren Einflussfaktoren während der Produktkonfiguration. In einer Reihe von Online- und Labor-Experimenten werden die Präferenzen der Teilnehmer bei der Konfiguration von Automobilen und Sport Schuhen getestet. Abschließend werden in Teil III konsumentenspezifische Einflussgrößen auf den wahrgenommenen Wert von Mass Customization untersucht, indem eine Umfrage unter Nutzern eines etablierten Mass Customization Systems einer globalen Sportartikelmarke durchgeführt wird.

Die Ergebnisse zeigen auf, dass Mass Customization vor allem eine attraktive Option für extrovertierte Konsumenten sowie für Personen, die gerne Neues erfahren, darstellt. Außerdem wird deutlich, dass die Präferenzen von Konsumenten während des Konfigurationsprozesses von der Information über die Wahl anderer Konsumenten beeinflusst wird und zu einem divergenten Wahlverhalten führt. Während Konsumenten einzigartige Optionen in hedonischen Produktattributen bevorzugen, tendieren sie dazu, ihre Entscheidungen an die Wahl anderer Konsumenten in utilitaristischen Attributen anzupassen. Darüber hinaus zeigen die Ergebnisse auf, dass Mass Customization insbesondere einen Mehrwert für Maximizer, Lead User und stark in den Produktkauf

involvierte Konsumenten bietet, indem es sowohl den produkt- als auch den prozesssbezogenen Nutzen für diese steigert. Allerdings müssen hierbei die Risiken wie die kognitive Überlastung, die für bestimmte Konsumenten durch die Vielfalt an Optionen im Mass Customization zustande kommen kann, berücksichtigt werden. Diese verringert signifikant die Kaufwahrscheinlichkeit eines selbst-konfigurierten Produktes.

Als Schlussfolgerung kann festgehalten werden, dass diese Dissertation die Wichtigkeit einer differenzierten Perspektive auf den wahren Mehrwert von Mass Customization aufzeigt. Das Vorhandensein sowie die Höhe des Wertzuwachses durch selbst-konfigurierte Produkte verglichen mit dem Wert von Standard-Produkten wird von den individuellen Eigenschaften der Kunden mitbestimmt. Umso wichtiger ist es deshalb, auf diese unterschiedlichen Bedürfnisse einzugehen indem die Mass Customization-Strategie wiederum selbst auf die verschiedenen Kundensegmente abgestimmt wird. Diese Dissertation hält eine Vielzahl an Implikationen sowohl für zukünftige Forschungsvorhaben auf diesem Gebiet als auch für Unternehmen, die konfigurierbare Produkte anbieten oder beabsichtigen, diese anzubieten.

1 Introduction

1.1 Motivation

> *"A company that aspires to give customers exactly what they want must look at the world through new lenses. It must use technology to become two things: a mass customizer that efficiently provides individually customized goods and services, and a one-to-one marketer that elicits information from each customer about his or her specific needs and preferences. The twin logic of mass customization and one-to-one marketing binds producer and consumer together in what we call a learning relationship – an ongoing connection that becomes smarter as the two interact with each other, collaborating to meet the consumer's needs over time."*
>
> *(Pine, Peppers, and Rogers, 1995: p. 103)*

Consumers' needs have become increasingly diverse (Gilmore and Pine, 1997, Franke, Keinz, and Steger, 2009). As the statement of Pine et al. (1995) indicates, this trend requires companies to adjust their offering and marketing to the needs of each consumer by learning about these individual needs over time. However, need-related information is often *"sticky"* on the consumer side (von Hippel, 1994: p. 430), making it difficult and costly to transfer to the manufacturer (von Hippel, 2002). A solution is to direct consumers themselves towards fulfilling need-related tasks while leaving solution-related tasks with the manufacturer (von Hippel and Katz, 2002). Indeed, it is beneficial for companies to empower their customers by giving them an active role as co-creators of their own product (Füller, Mühlbacher, Matzler, and Jawecki, 2009, Fuchs and Schreier, 2011). Mass customization utilizes this strategy by enabling consumers to adapt a product in different dimensions to their specific needs while retaining (mass-like) production on the manufacturer side.

There are many prominent examples across numerous industries that have successfully implemented this approach. One of the prime examples that changed production from mass production to customer-specific, made-to-order processes, is the automotive industry (Pine, Victor, and Boynton, 1993). Most of the large automotive

manufacturers such as BMW[1], Volkswagen[2], General Motors[3], and Toyota[4] offer configuration toolkits that allow customers to personalize and adapt their car according to their preferences. By now, mass customization has spread across various other branches such as bicycles (e.g., Urbike[5]), skis (e.g., Edelwiser[6]), shirts (e.g., tailorstore[7]), sportswear (e.g., NIKEiD[8], mi adidas[9]), or even cereals (e.g., MyMuesli[10]). NIKEiD, a subdivision of sportswear manufacturer Nike offering customizable sports shoes, has already substantially contributed to the profit of Nike for half a decade (Brohan, 2010). MyMuesli, which offers customizable cereals, is regarded as one of the most successful start-ups in Germany (Esser, 2015). These examples show that mass customization can be a successful business approach for both established companies and emerging ones.

Powered by new technologies that alleviate personalized manufacturing strategies, this spectrum is anticipated to further expand. It is already receiving attention from large global players such as Google, whose project *"Ara"*, a fully modular customizable smart phone, has the potential to be the *"first full-scale, aggressive movement to something definitely outside the bounds of simple mass production"* (Hessman, 2014: p. 16). Moreover, recent developments in the area of 3D printing systems further accentuate the trend towards individuality. The market for 3D printing increased by 34.9% to $ 3.07 billion in 2014, mainly driven by the availability of personal 3D printers for under $ 5,000 (Wohlers, 2014). This development could even be considered as the next evolutionary step of the mass customization approach towards full individualization (Hessman, 2014).

Simultaneously to the evolution of mass customization in business, academic interest in this topic has strongly increased. Between their two literature reviews in 2001 and 2012, Fogliatto, da Silveira, and Borenstein identified a growth of relevant articles from 72 to 149, an increase of over 100%. Besides a deeper understanding of the general success factors and enablers of mass customization as well as further specification of the interaction between producers and consumers, the economics of

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[1] http://www.bmw.de/de/home.html; last website access: 04.06.2015, 09:21.
[2] http://www.volkswagen.de/de.html; last website access: 04.06.2015, 09:22.
[3] http://www.gm.com/; last website access: 04.06.2015, 09:24.
[4] http://www.toyota.com/; last website access: 04.06.2015, 09:24.
[5] http://urbike.de/; last website access: 04.06.2015, 09:26.
[6] http://edelwiser.com/; last website access: 04.06.2015, 09:26.
[7] https://www.tailorstore.de/; last website access: 04.06.2015, 09:29.
[8] http://www.nike.com/de/de_de/c/nikeid; last website access: 04.06.2015, 09:31.
[9] http://www.adidas.de/personalisieren; last website access: 04.06.2015, 09:32.
[10] http://www.mymuesli.com/; last website access: 04.06.2015, 09:35.

mass customization from the perspectives of both consumers and producers has been highlighted as one of the central research streams within mass customization (Fogliatto, da Silveira, and Borenstein, 2012). From the consumer perspective, research has specifically adressed if and why mass customization provides a higher value to consumers (e.g., see Franke and Piller, 2004, Schreier, 2006). Several driving factors have been identified so far including a higher preference fit for consumers and product uniqueness (cf. Merle, Chandon, Roux, and Alizon, 2010). Research has particularly highlighted that consumers do not only benefit from the customized product itself, but also from the self-design process (e.g., see Franke and Schreier, 2010, Franke, Schreier, and Kaiser, 2010b).

However, customization requires consumers' willingness to engage in the activity of customization. While some consumers may perceive this activity as enjoyable, others rather regard customization as laborious and effortful (Franke and Schreier, 2010). Furthermore, customization increases the number of choices having to be made by consumers, as they must decide on individual product attributes rather than simply evaluating complete product alternatives. Research has shown that increasing the number of choices may have detrimental effects on consumers' satisfaction and willingness-to-purchase (Iyengar and Lepper, 2000). In the context of mass customization, research has also begun to assess these potential pitfalls, particularly addressing the problem of *"mass confusion"* through increased choice complexity (Huffman and Kahn, 1998, Dellaert and Stremersch, 2005). Consequently, mass customization does not seem to be an approach that is equally attractive for all types of consumers. There is some sparse support in the existing literature indicating that individual differences affect the motivation to use a customization system (Fiore, Lee, and Kunz, 2004) and the willingness to pay a price premium (Hunt, Radford, and Evans, 2013). However, these suggestions lack comprehensive empirical investigations including the effects on the identified (product- and process-related) value drivers of customized products as well as the potential risk of choice overload. In this dissertation I elucidate this complex and ambiguous research field by exploring to understand what consumer types are overloaded through customization and how different types of buyers and non-buyers of customized products perceive the product and process value of customization.

Additionally, this dissertation is motivated by a significantgap in the literature. So far, research has focused on consumers' evaluation of their self-designed products (cf.

Franke and Piller, 2004, Franke et al., 2009, Merle et al., 2010). Although it is recognised that consumers' decisions are influenced by different determinants (e.g., see Dhar and Nowlis, 2004, Mogilner, Rudnick, and Iyengar, 2008, Sela, Berger, and Liu, 2009, Sela and Berger, 2012), research into consumers' decision making behavior in mass customization has so far been largely neglected. The Marketing Science Institute has included the understanding of consumer behavior into their tier 1 research priorities for 2014-2016 (Marketing Science Institute, 2014). Investigating this behavior is particularly interesting as past research on mass customization has identified further value drivers for consumers such as uniqueness (Franke and Schreier, 2008) in addition to the increase in utility. Recent research proposes a differentiated perspective on consumer choice behavior that incorporates the component of the *"sociality of choice"* (McFadden, 2013: p. 29) as an additional driver of consumer decisions on top of mere utility maximization. I adopt this approach to investigate the influence of information about other consumers' choices on decision making in mass customization. I test how consumers utilize this information in order to either differentiate themselves from others (as uniqueness is one of the central value drivers in customization), or to conform to others (Cialdini and Goldstein, 2004), and what determines one or the other behavior. I test this psychological conflict in controlled experimental settings in order to contribute to the sparse understanding of consumers' decision making behavior in mass customization. My findings do not only advance research on social psychology and consumer behavior in mass customization, but also contain valuable practical implications. Understanding the behavioral economics behind consumers' decisions also helps companies to develop a strong and beneficial relationship with their customers (Cummings, Dhar, and Welch, 2015).

1.2 Research objectives

The findings outlined above, emphasize the high practical and theoretical relevance of research on mass customization. With this dissertation I contribute to this evolving stream of research. The thesis has three main objectives, which are structured according to the chronological points of contact of consumers with this business approach, from pre-customization interest to consumer behavior during the customization process and finally to consumers' post-customization perceptions.

The first objective is to explore the current awareness and general attractiveness of mass customization for consumers. For that purpose, I assess the extent to which consumers are generally interested in customizing their products. In addition, I test whether this interest can be predicted by personality factors from social psychology.

The second objective is to identify determinants of consumers' choice behavior in customization. Therefore, I assess how consumers make their decisions when customizing their product and whether these decisions can be influenced by providing them with information about choices of other consumers. In particular, I investigate consumers' preference for uniqueness and conformity in different attributes of a customizable product.

Finally, I aim to elucidate how the perceived value in customization is contingent on consumer-specific antecedents. These antecedents comprise individual personality traits as well as domain-specific consumer attributes. I test the effect of these variables on the central factors influencing value in mass customization that have been highlighted by past research. In order to determine these effects, I survey real users of a customization system.

1.3 Structure of the dissertation

This dissertation consists of seven main sections (overview in Figure 1). In the next section (2), I elaborate on the key conceptual foundations of mass customization that are relevant to this dissertation. I begin with briefly disclosing the roots and fundamental components of this approach. I then present a classification of different mass customization systems. Finally, I explain the comprehensive framework of value increments and detriments that have been identified by past research regarding consumers of customized products.

Section 3 includes the general method employed in this dissertation as well as its rationale. Moreover, I provide an introduction into the two research methods that I use – that is, the survey method and experimental designs for social research.

Sections 4, 5 and 6 make up the central parts of this thesis (parts I-III) and are structured chronologically according to consumers' different points of contact with mass customization. I begin with consumers' pre-customization experience (section 4). Here, I assess consumers' general interest and its determinants in customization by conducting an online survey. Section 5 deals with the actual customization activity. In a series of

online and laboratory experiments I test consumers' choice behavior during the customization process. Finally, in section 6, I conduct a survey among real users of an established mass customization system in order to identify consumer-specific determinants of value in mass customization. As the survey respondents were asked about their perceptions of their past customization, this section covers the post-customization view of consumers.

The last section of this dissertation (section 7), summarizes the findings and contributions from the three central parts. I also provide managerial implications derived from these findings and highlight overarching directions for future research in this field.

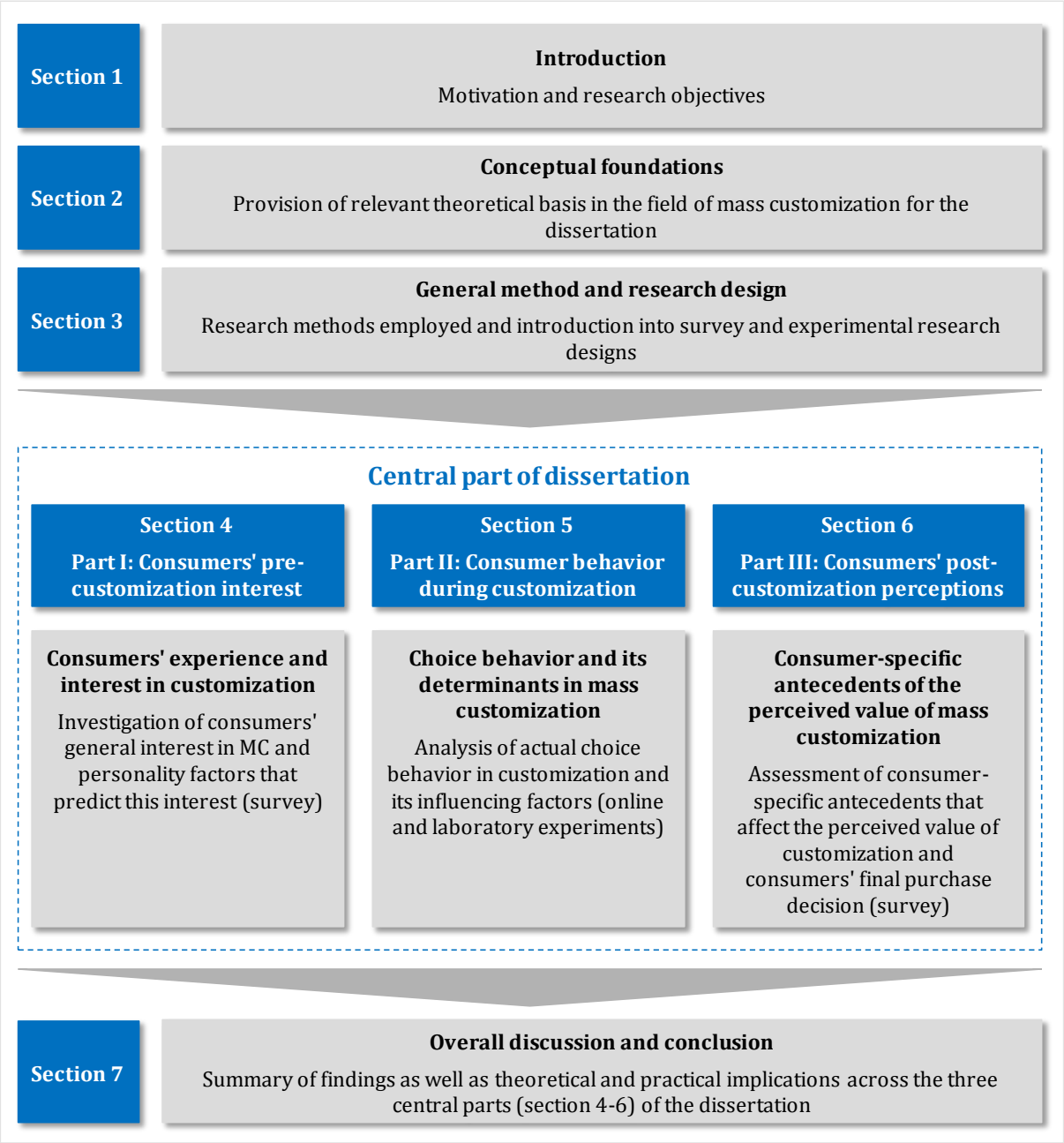


Figure 1: Structure of this dissertation

2 Conceptual foundations

In this section I explain the background and origin of mass customization as well as the central principles and components the approach is based on. In addition, I elucidate the existing research streams and their findings that are relevant to this thesis within the academic field of mass customization, more precisely the typology of mass customization and the value drivers and detriments from the consumer's point of view.

2.1 Definition of the term *"mass customization"*

Stanley Davis may be viewed as the originator of the term *"mass customization"* (MC). In his book *"Future Perfect"* he stated: *"Mass customization of markets means that the same large number of customers can be reached as in mass markets of the industrial economy, and simultaneously they can be treated individually as in the customized markets of pre-industrial economies"* (Davis, 1987: p. 169).

Since then, the definition of *"mass customization"* has undergone an evolution which has led to increasingly precisely defined characteristics. Pine (1993a) was the first to further develop Davis' initial definition into a comprehensive business approach. According to him, mass customizing companies have the primary goal to deliver *"goods and services with enough variety and customization that nearly everyone finds exactly what they want"* (Pine, 1993a: p. 44). This is in contrast to the dominating goal of mass producers – selling standardized products at high volumes and lowest possible costs.

However, mass customization represents a way to solve the oxymoron of mass production efficiency on the one hand and the adaption of products to individual needs of customers on the other hand (Pine et al., 1993, Piller and Tseng, 2010). Tseng and Jiao incorporate this element and characterize mass customization by *"producing goods and services to meet individual customer's needs with near mass production efficiency"* (Tseng and Jiao, 2001: p. 685).

For this dissertation, I regard mass customization as a business approach for companies to provide the possibility of individualization of a pre-defined number of product modules for their customers while keeping a sufficient degree of mass production efficiency.

2.2 The evolution of mass customization

Since the time of Henry Ford, industry had been dominated by the paradigm of mass production (Pine, 1993a). Producers focused on standard goods for large homogeneous market segments, which allowed them to realize low prices due to economies of scale under the pre-condition of stability and control (Pine, 1993a).

However, in the 1990s mass markets started to become fragmented (Mueller-Heumann, 1992), giving birth to a new concept: mass customization. The reason for this fragmentation was twofold. On the one hand, heterogeneity of customers' needs and wants increased and was more exposed to changes (Hart, 1995), leading to a psychographic fragmentation amongst customers (Mueller-Heumann, 1992). On the other hand, this process was provoked by companies themselves: advances in technology strongly increased flexibility in the production process and allowed them to actively promote opportunities for product differentiation in marketing while still keeping economies of scale (Mueller-Heumann, 1992, Pine et al., 1995).

Similarly, Reichwald and Piller (2009) interpret mass customization as the consequence of an increasing individualization of customer demand. To allow for a better coverage of individual customer needs, a company must be aware of these needs. As it is impossible for a company to fulfill the individual needs of each customer without assistance of the customers themselves, customers need to take an active role in the process of realization of goods and services, shifting value creation from a producer-focused approach towards a form of interactive value creation between producer and customers (von Hippel and Katz, 2002, Reichwald and Piller, 2009).

Initially, mass customization was considered as a concept replacing the existing paradigm of mass production (Pine, 1993a, Pine et al., 1993). However, Kotha (1995) showed that mass customization does not necessarily result in the replacement of an existing mass production system, instead it can provide a beneficial extension of a company's existing capabilities. Support for this argument can be seen when reviewing successful mass customization examples from industry: For example, large sportswear

manufacturers such as Nike and Adidas provide offers of customizable products (*"NIKEiD"*, *"mi adidas"*) in addition to their core business. They keep mass production as their predominant business approach but expand it with customizable offers in specific business areas to better address the needs of those customers who desire active involvement in the product design process.

Today, mass customization is widespread across different industries and countries (Goffe, 2013) and is considered to remain one of the major trends which in future will impact not only companies but whole supply chains (Fuller, Mercier, Brocca, and Morley, 2013). Piller, Salvador, and Walcher (2012) identified more than 900 companies from 11 industry fields that offer customized products to end customers. Particularly in the categories *"media"*, *"fashion"*, and *"food"* the authors find a large number of firms who mass customize products (Walcher and Piller, 2012). As mentioned in the introduction of this dissertation, new developments in the area of 3D printing (Wohlers, 2014) as well as the recent interest drawn to this approach by large players such as Google (Hessman, 2014) indicate a further expansion of mass customization.

2.3 Key principles and fundamental components of mass customization

2.3.1 Key principles of mass customization

In general, the implementation of a mass customization strategy follows three key principles (adapted from Piller and Ihl, 2002, Piller, 2004):

- Customer integration: Customers are integrated into the value creation process of a product; an interface between customer and producer must exist that allows customers to transfer their need-related information to the producer.
- Fulfillment of individual needs: MC products fulfill the needs of customers to a higher degree than standard goods do; this can be accomplished in different product aspects such as aesthetics or functionality.
- Efficient production: To keep the efficiency of mass production, individualization needs to be limited to a pre-defined number of attributes, resulting in fixed latitude in design, yet in which the customer is able to freely move.

These principles require some fundamental components to be in place, which I briefly review in the following section.

2.3.2 Fundamental components of a mass customization approach

Integrating customers via toolkits

An essential part of mass customization is customer integration via an interface between the producers and their customers. This allows companies to gain access to need-related information about their customers. However, information that is related to the needs of the customers is often *"sticky"* and difficult to transfer from the customers to the producer (von Hippel, 1994, 1998, 2005). Toolkits solve this issue by enabling producers to transfer these need-related tasks to the customers themselves while leaving solution-related tasks (i.e. fabrication of the product) to the producer (von Hippel, 2001). The term *"toolkit"* refers to a software tool which is often web-based and which creates an interface between companies and their customers. It is synonymous with expressions such as *"choiceboard"* (Slywotzky, 2000: p. 40), *"configurator",* or *"design system"* (Franke and Piller, 2003: p. 4). According to von Hippel and Katz (2002: p. 825), a toolkit empowers *"users to create and test designs for custom products or services that can then be produced 'as is' by manufacturers"*. When setting up the toolkit, companies must not only consider internal production restrictions, but also the capability of their customers to co-design their own products (Theilmann and Hukauf, 2014).

Modularizing products

Mass customization increases cost and complexity on the manufacturer side (Alford, Sackett, and Nelder, 2000). Thus, manufacturers have to look for a cost-efficient way to realize a customized product offer. To keep mass production efficiency, the product or service offer has to be modularized (da Cunha, Agard, and Kusiak, 2010, Fogliatto et al., 2012). Modularization is also frequently applied in open design projects (Raasch, Herstatt, and Balka, 2009) to reduce complexity when a multitude of users takes part. In mass customization, the general structure of the product is retained for every individualized variant, and the concept of individualization is standardized again (Piller, 2006). Product modularization is crucial to overcoming the discrepancy between individualization and mass production, as it limits the complexity within the

manufacturing process that is evoked through the possibility of customization (Duray, Ward, Milligan, and Berry, 2000, Schenk and Seelmann-Eggebert, 2002). One of the most prominent examples of product modularization is in the automotive industry with its made-to-order processes (Miceli, Ricotta, and Costabile, 2007), where customers can choose each single module of their car such as the exterior color or the extra equipment.

Anticipating heterogeneous consumer needs

Particularly in markets where consumers' needs are heterogeneous and deviate largely, the possibility to adjust the product to consumers' needs via customization generates value for consumers (Pine, 1993a, Franke and von Hippel, 2003, Piller and Tseng, 2010). Thus, it is of utmost importance for a company to anticipate these heterogeneous needs in order to define the *"right"* modules and parameters for customization, which ultimately determines consumers' perceived utility (Salvador, Holan, and Piller, 2009, Piller et al., 2012). Only if consumers perceive an increase in value of the customized product compared to the standard variant, are they willing to use the MC system instead of purchasing the standard product (Schreier, 2006).

As mass customization and its components discussed above can be implemented in manifold ways, different types of this business approach exist. In the next section I will classify these variants by highlighting the relevant criteria that have been discussed by past research and provide an integrated framework of mass customization.

2.4 Classification of mass customization approaches

There is no uniform concept of mass customization; producers can realize mass customization in different ways. A broad research stream has evolved out of this, resulting in a large quantity and variety of proposed MC classifications (e.g., see Gilmore and Pine, 1997, Duray et al., 2000, Da Silveira, Borenstein, and Fogliatto, 2001, Dahan and Hauser, 2002, Tien, 2006). I have identified three general key classification criteria for mass customization which I discuss in the following sub-sections.

2.4.1 "Width" of customization: the extent of customer integration

I termed the first classification criterion as *"width of customization"* which describes the extent to which the customer is integrated into the product creation

process along the value chain. Several scholars highlight the extent of customer integration as an important dimension of a MC framework (Pine, 1993b, Da Silveira et al., 2001, Rudberg and Wikner, 2004). They argue that mass customization can take place at different stages of the value chain – from very early customer integration via co-development of a complete product to customization that takes place in the usage phase after the production process (Da Silveira et al., 2001).

Other scholars use similar models for their MC framework. Rudberg and Wikner (2004) base their MC model on the customer order decoupling point. This point defines the switch from certainty to uncertainty about customer demand (Rudberg and Wikner, 2004) which takes effect when customers are integrated into the process and thus represents another possibility to determine different stages of mass customization. Walcher and Piller (2012) use the point of customer integration to distinguish between two types of mass customization: soft- and hard customization. Soft customization refers to products that are customized after the production process, either by the retailer or the customers themselves. Here, the complete customization (virtual and physical) is uncoupled from the production process. In contrast, hard customization incorporates the physical customization activity into the production process.

Lampel and Mintzberg (1996) discuss different customization strategies of companies depending on the context of value chain stages (design, fabrication, assembly, and distribution). They discriminate between five levels of customization, ranging from *"pure standardization"* to *"pure customization"*. Other authors build on this logic and propose a more granular scale. For example, Da Silveira et al. (2001) provide a model with eight customization levels (see Figure 2), from full co-design (highest degree of customization) to customized usage (lowest degree of customization before standardization), which represents the most detailed classification of the discussed approaches.

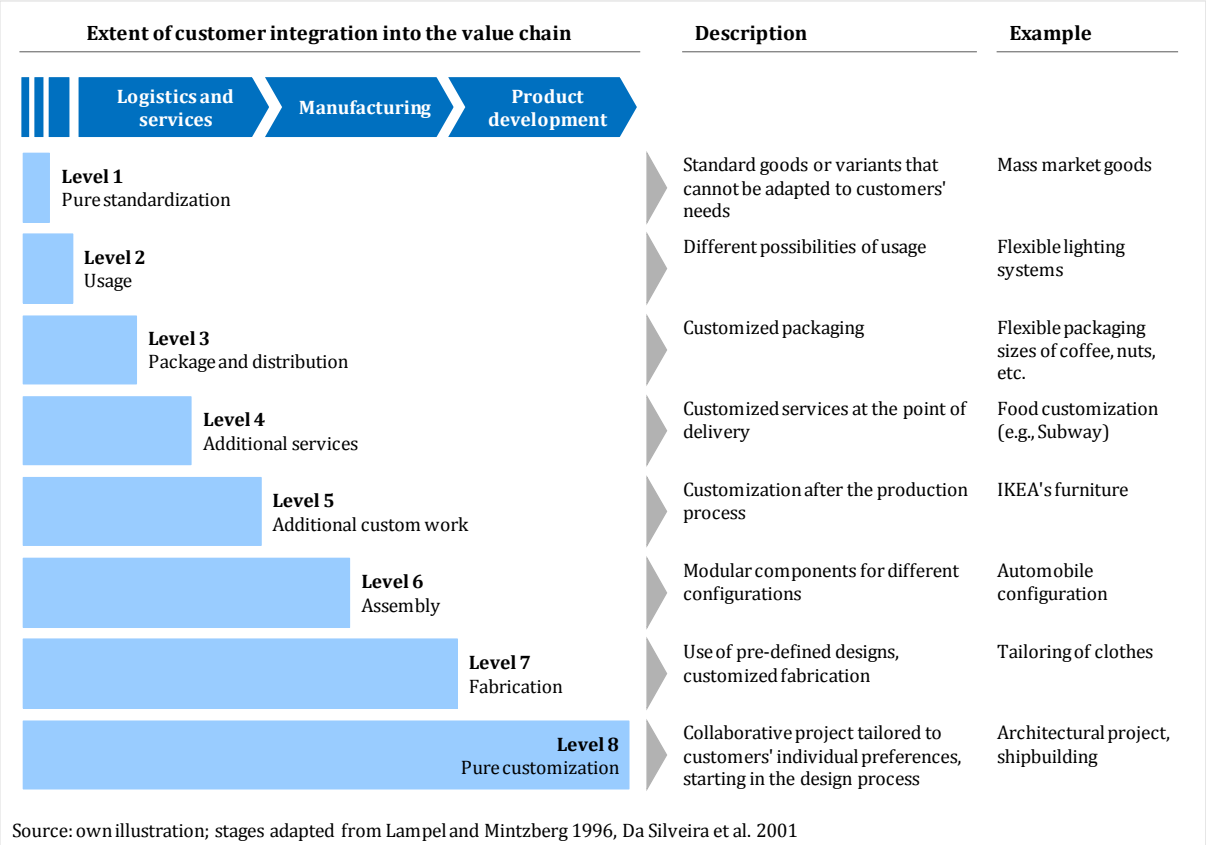


Figure 2: "Width" of customization: the extent of customer integration

2.4.2 "Depth" of customization: the degree of design freedom

Another central criterion in the classification of different types of mass customization is the degree of design freedom (e.g., see Duray et al., 2000, Miceli, Raimondo, and Farace, 2013), which I termed as *"depth"* of customization. It is the amount of freedom that a company gives to their customers when they are integrated into the product creation process.

For example, Duray et al. (2000) classify four archetypes of mass customization, depending on two dimensions: the point of customer involvement (early vs. late in the production process) and the degree of modularity (original designs vs. standardized components). While the point of customer involvement corresponds to *"width"* of customization, the degree of modularity represents the *"depth"* of customization, which is the design freedom customers have when customizing their product.

This depth of customization is also represented by the *"solution space"* a MC company offers to their customers (Franke and Piller, 2004, Piller, 2004, Piller and

Müller, 2004). The solution space comprises the total amount of possibilities customers have to customize a product to their preferences (Figure 3). For example, customers of an automobile are able to decide on different product features such as the engine type, the color of the car, and additional equipment. Within each of these features they can choose between a fixed set of options, e.g., a certain number of different exterior colors. Thus, the degree of design freedom depends on the number of customizable attributes (engine, exterior color, etc.) and the number of options within each of these attributes (black, blue, red, etc.).

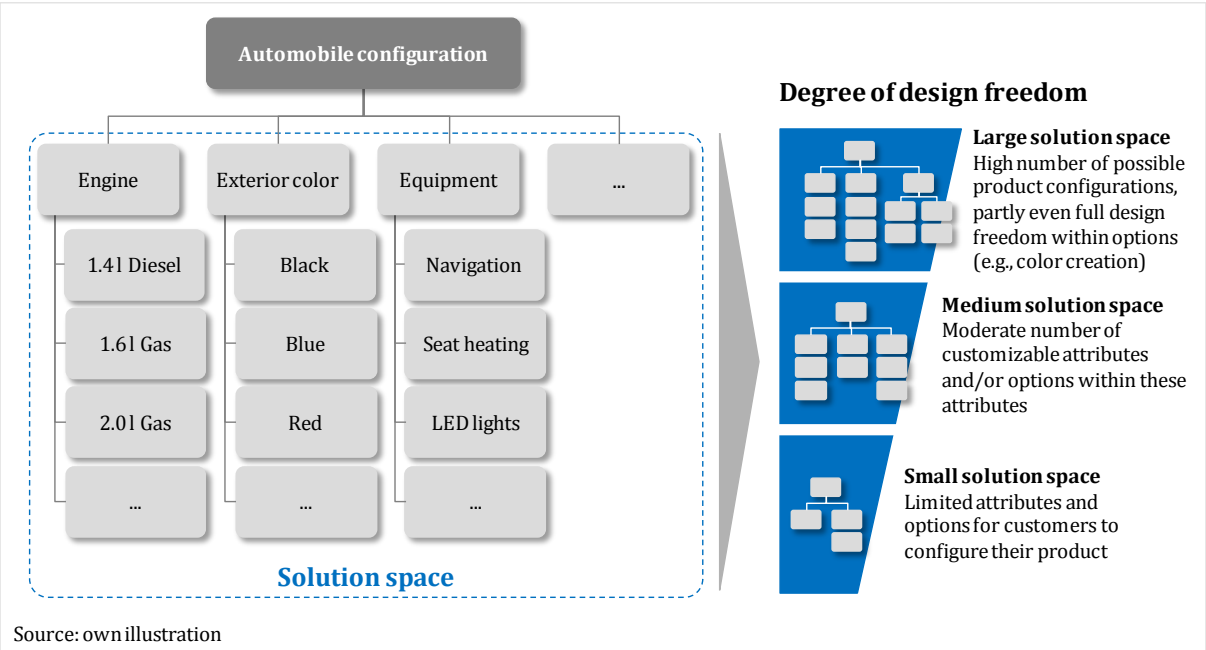


Figure 3: "Depth" of customization: the degree of design freedom

2.4.3 Mode of customer integration

The third classification criterion is the mode of customer integration. Past research has highlighted and discussed different ways to realize the integration of customers (e.g., see Randall, Terwiesch, and Ulrich, 2007, Kamis, Koufaris, and Stern, 2008, Valenzuela, Dhar, and Zettelmeyer, 2009, Hildebrand, Herrmann, and Häubl, 2012).

Randall, Terwiesch, and Ulrich (2005, 2007) distinguish between a parameter-based and a needs-based configuration. In a parameter-based environment, customers directly decide on the individual design parameters of the product (Randall et al., 2007). An example would be the car configuration depicted above in Figure 3. By contrast, a

needs-based system only requires customers to state their preferences without choosing specific options (Weinmann, Robra-Bissantz, Witt, and Schmidt, 2011). Based on these preferences, the system recommends the best fitting configuration to the customer through an optimization algorithm (Randall et al., 2007). For example, buyers of customized cereals could state their taste preferences and receive an automated recommendation from the system.

Other researchers use an alternative approach: they discriminate between attribute- and alternative-based customization systems (Kamis et al., 2008, Valenzuela et al., 2009). While an attribute-based system corresponds to the parameter-based system specified above, an alternative-based system provides choice sets for the customers to choose from. In other words, these systems aggregate the number of choices for customers and reduce the required number of choices a customer has to make. An example would be the extras packages that are offered by many car manufacturers (e.g., the car brand MINI provides different packages to their customers that bundle multiple extras[11]).

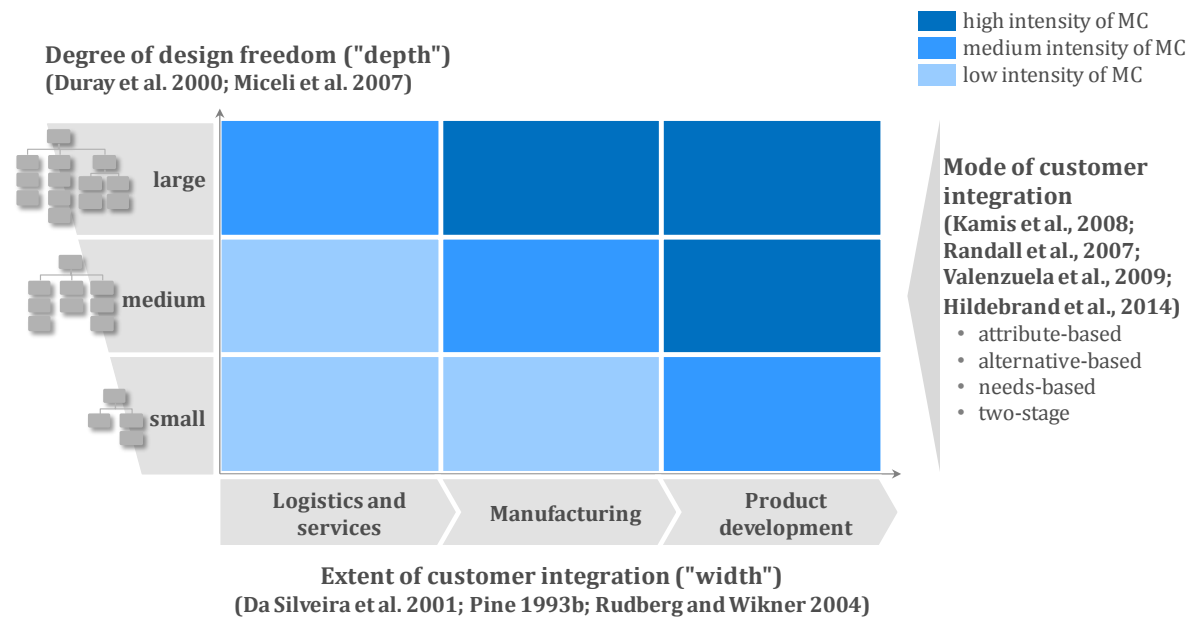
In a recent series of experiments, Hildebrand, Herrmann, and Häubl (2014) tested a hybrid model of an attribute- and alternative-based approach, where customers use pre-defined starting solutions as a basis for their own customization (a two-stage process). This hybrid approach can also be found in real use. For example, Nike offers design templates to their NIKEiD customers which aim to serve as inspiration for them[12]. Similarly, BMW gives customers the option to choose between different *"lines"* at the start of their configuration (luxury, modern, sporty)[13]. Each of these lines contains a different subset of options for customers to choose from.

Past research identified that these different ways of customer integration also influence important outcomes of customization. Particularly for a large solution space, attribute-based systems positively affect the perceived ease of use and task enjoyment (Kamis et al., 2008) as well as the satisfaction with the outcome and willingness-to-purchase (Valenzuela et al., 2009) compared to alternative-based systems. For inexperienced users, a needs-based system yields to higher utility for customers than a parameter-based system (Randall et al., 2007). Finally, the hybrid two-stage process reduces complexity and increases satisfaction for consumers (Hildebrand et al., 2014).

[11] http://www.mini.de; last website access: 23.02.2015, 15:23.
[12] http://www.nike.com/de/de_de/c/nikeid; last website access: 05.03.2015, 13:11.
[13] http://www.bmw.de; last website access: 23.02.2015, 15:27.

2.4.4 An integrated framework for the classification of mass customization

By combining the extent of customer integration (width) and the degree of design freedom (depth), the intensity of mass customization can be determined. Figure 4 provides a schematic illustration of this two-dimensional framework. This helps to determine the intensity of mass customization that a company applies. The higher the extent of customer integration and the higher the degree of design freedom is, the stronger the intensity of mass customization is. The third criterion, the way customers are integrated into the product creation process, is incorporated as a supplementary factor, which further classifies a mass customization system.



Source: own illustration

Figure 4: Schematic framework for classifying different MC approaches

2.5 The value of mass customization from the consumer's point of view

As outlined in the introduction, my thesis focuses on the consumer perspective of mass customization. Therefore the benefits and detriments of mass customization for consumers are highly relevant. An overview of those is presented in this section below.

2.5.1 Benefits of mass customization for consumers

Mass customization provides a value increase for consumers (Schreier, 2006) and positively affects satisfaction (Kamali and Loker, 2002). Past research has shown that consumers are willing to pay significantly more for a product they customized than for the standard variants. Franke and Piller (2004) conducted an experiment where participants designed their own watches with a commercial online toolkit and were then able to make a real purchase of their customized watch via Vickrey auction (Vickrey, 1961). They found a significant increase of participants' willingness-to-pay (ranging from 23% to 30%) for their customized watches compared to the standard watches they offered to the participants.

What drives this increase in willingness-to-pay? An extensive area of research within the academic field of mass customization has dealt with this question. Several driving factors of the value increase of customized products have been identified which can be broken down into product-related benefits and process-related benefits (Schreier, 2006, Merle, Chandon, and Roux, 2008, 2010). Figure 5 provides an overview of these two dimensions and their value drivers.

Product-related benefits comprise of all value drivers that can be directly assigned to the product itself: the increase in preference fit resulting from a better coverage of consumers' individual needs (Franke et al., 2009), as well as the value of uniqueness and self-expressiveness, which evolve through the possibility for consumers to differentiate themselves from buyers of standard products (Franke and Schreier, 2008, Merle et al., 2010, Moreau and Herd, 2010).

Besides these components that are related to the product itself, consumers obtain benefits from the design process. In particular, two process-related benefits have been discussed in the field of mass customization: the hedonic value, representing the enjoyment of the customization process (Franke and Schreier, 2010), and the authorship value, which arises through the own creative achievement during customization (Franke

et al., 2010b). In the following sections I explain the product- and process-related value components in detail.

	Benefits for consumers in mass customization		Support in literature
Product-related benefits	Preference fit	Customized products better fit consumers' individual preferences	Dellaert and Stremersch, 2005 Franke, Keinz, and Steger, 2009 Franke and Piller, 2004 Randall, Terwiesch, and Ulrich, 2007
	Uniqueness	Customized products are perceived unique by consumers	Fiore, Lee, and Kunz, 2004 Franke and Schreier, 2008 Merle, Chandon, Roux, and Alizon, 2010 Schreier, 2006
	Self-expressiveness	Customized products help signaling consumers' identity	Atakan, Bagozzi and Yoon, 2014 Merle, Chandon, Roux, and Alizon, 2010
Process-related benefits	Process enjoyment	Consumers enjoy the design process itself	Franke and Schreier, 2010 Merle, Chandon, Roux, and Alizon, 2010 Schreier, 2006
	Creative achievement	Consumers are proud of their own piece of work ("I designed it myself")	Franke, Schreier, and Kaiser, 2010 Mochon, Norton, and Ariely, 2012 Norton, Mochon, and Ariely, 2012 Troye and Supphellen, 2012

Source: own illustration

Figure 5: Overview of benefits for consumers in mass customization

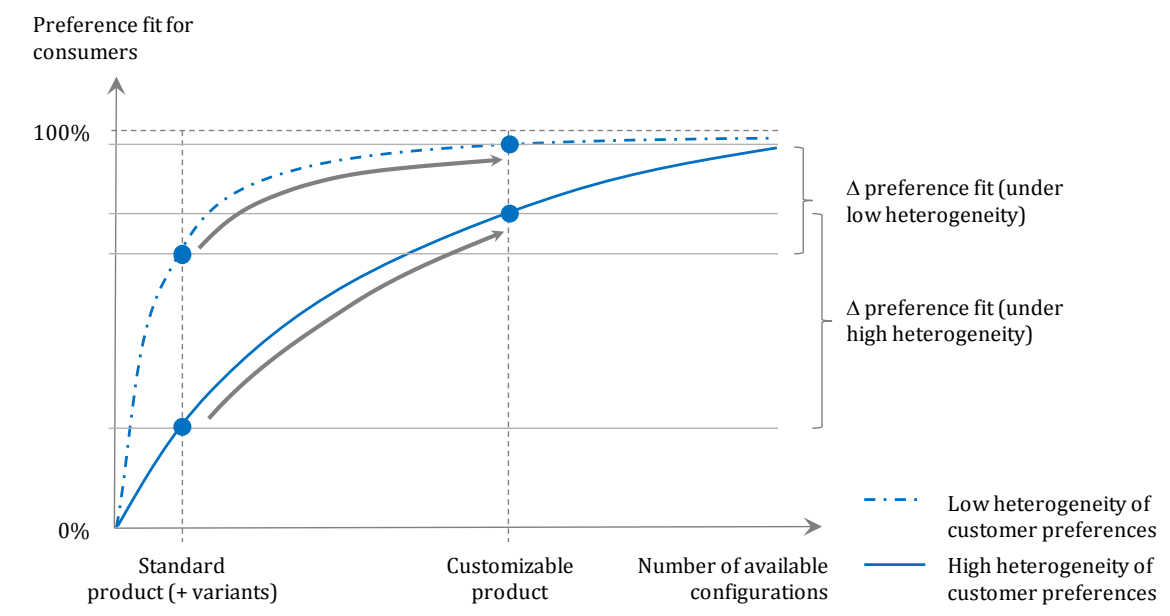
2.5.2 Product-related benefits for customers

Preference fit

The most thoroughly investigated value driver in mass customization is the increase in perceived utility, resulting from an increase in consumers' preference fit (Schreier, 2006, Randall et al., 2007, Franke et al., 2009). Standard products aim at fulfilling the needs of the average consumer (Franke and von Hippel, 2003, Franke, Keinz, and Steger, 2010a). By customizing a product, consumers are able to adapt a product to their individual preferences (von Hippel, 2001, Schreier, 2006). Thus, they are able to achieve a higher preference fit. In a series of experiments, Franke et al. (2009) provide empirical evidence for this value driver: they tested the willingness-to-pay in five product categories (newspapers, pens, kitchen, skis, cereals) for both the standard and the customized version. In all five categories they found a significant

increase in participants' willingness-to-pay for the customized alternative, ranging from 34% to 50%.

This increase in preference fit depends on the heterogeneity of consumers' preferences. While the additional value of mass customization is low for products where consumers' preferences are prevailingly homogeneous (e.g., salt, rice, wheat), it is particularly heightened for products, where these preferences strongly diverge amongst consumers (Franke and Piller, 2004). Figure 6 illustrates this relationship: the higher the heterogeneity of consumers' preferences, the higher is the number of different configurations that are required to fully satisfy the different preferences. Hence, these preferences can be better fulfilled by mass customization. Even though mass customization still cannot cover 100% of the preferences of all individuals due to the principle of modularity (customizable products also require a basic product structure which cannot be influenced by consumers in order to keep mass production efficiency), the coverage of consumers' preferences is strongly increased compared to a standard product and its variants.



Source: own illustration

Figure 6: Differences in preference fit between a standard and a customized product

The value of uniqueness and self-expressiveness

In addition to the increase in preference fit, customized products offer additional benefits due to their uniqueness (Fiore et al., 2004, Schreier, 2006, Franke and Schreier, 2008). Products often contain symbolic meanings besides their utilitarian value (Ligas, 2000). In particular, the feeling of uniqueness and the possibility to express one's distinctiveness are important reasons for consumers to purchase a product (Lynn and Harris, 1997b, Tian, Bearden, and Hunter, 2001). Mass customization allows customers to feel more unique compared to buyers of off-the-shelf products as it strongly increases the number of available product variants. Franke and Schreier (2008) provide empirical evidence that uniqueness is a separate contributor to the value of a self-designed product. This is particularly true for individuals with a strong desire for unique consumer products (Lynn and Harris, 1997a). This value driver is particularly relevant for section 5 of my dissertation, where I test consumers' actual preference for unique options in customization.

According to Merle et al. (2010), self-expressiveness is another independent driver of consumer value in mass customization separate to uniqueness. The authors distinguish these two factors through the difference in self-orientation vs. other-orientation (Holbrook, 1999): while uniqueness value evolves through the possibility to differentiate oneself from others, self-expressiveness value arises through the fact that the customized product allows the reflection of one's identity (Merle et al., 2010). In line with this research, Atakan, Bagozzi, and Yoon (2014) showed that customers develop a greater cognitive bond with the product when they are integrated into the design process, leading to an increased identification with the product.

2.5.3 Process-related benefits for customers

Process enjoyment

Customizing a product does not only comprise of product-related benefits for consumers but also benefits from the customization experience itself (Schreier, 2006, Franke and Schreier, 2010, Merle et al., 2010). Past research has shown that people engage in actually effortful activities such as open source software development for the simple reason that they enjoy it (Hertel, Niedner, and Herrmann, 2003). This driver is also present in the context of mass customization.

Franke and Schreier (2010) tested the existence of process enjoyment in an experimental setting. They let participants design their own scarves and measured their willingness-to-pay (WTP) in a Vickrey auction (Vickrey, 1961) with binding bids (the highest bidder had to purchase the self-designed scarf for the price of the second highest bid). Subjects were willing to pay significantly more for their self-designed scarf. The authors showed that this increase in WTP could be attributed not only to the increased preference fit, but also to the enjoyment of the design process. In addition they identified that this effect is moderated by the perceived preference fit: the increase in WTP through high process enjoyment is stronger when subjects also achieved a high preference fit. They argue that the design experience can create a positive *"mood"*, which consumers then transfer to the evaluation of the product value (Franke and Schreier, 2010: p. 1029).

Creative achievement

There is a second dimension to process-related benefits that consumers derive from designing a product themselves: the value of creative achievement (Merle et al., 2010), which is a result of the consumer's subjective evaluation of their own creation (Franke et al., 2010b). Franke et al. (2010b: p. 125) termed this effect the *"I designed it myself effect"*, which is defined by the *"value increment a subject ascribes to a self-designed object, arising purely from the fact that she feels like the originator of that object."* In an experimental setup they investigated this value driver by assessing the willingness-to-pay of a t-shirt that is objectively identical. While one group bid on a pre-selected t-shirt design, the other group reconstructed the exact same design by using a MC toolkit. The group that designed the t-shirt on their own was willing to pay significantly more, supporting the existence of a value increase through feelings of authorship (Franke et al., 2010b).

This effect is not only true for products with highly aesthetic or hedonic features such as t-shirts; it also emerges in product categories with predominantly utilitarian characteristics. Norton, Mochon, and Ariely (2012) demonstrated in an experiment that creators of IKEA boxes are willing to pay significantly more for their creation than subjects who have been offered an identical pre-assembled version of the box. This effect can be rationalized by feelings of competence that arise in the creator's self-perception (Mochon, Norton, and Ariely, 2012). In addition to the increased WTP, the

active integration of consumers into the value creation process positively affects their evaluation of the final outcome (Troye and Supphellen, 2012).

2.5.4 Drawbacks of mass customization for consumers

In addition to literature that highlights the potential of mass customization to increase value, a considerable amount of literature expresses a more critical view of this approach (Huffman and Kahn, 1998, Agrawal, Mercer, and Kumaresh, 2001, Zipkin, 2001, Bardakci and Whitelock, 2003, Squire, Readman, Brown, and Bessant, 2004). Several researchers argue that the value increase for consumers might be endangered by certain negative aspects that mass customization brings about. In this section of the dissertation I explain the most important value detriments from a consumer perspective.

Price premium and willingness-to-wait

The value of a product does not only consist of the perceived benefits, but also of the drawbacks for consumers such as the price they have to pay and the time they have to invest in the purchase (Zeithaml, 1988). These two aspects are particularly relevant in mass customization (Squire et al., 2004). Besides the price premium that buyers of customized products are often charged for the aforementioned increase in subjective value (Wind and Rangaswamy, 2001, Piller, Moeslein, and Stotko, 2004), customers have to accept a substantial increase in time until the customized product is fabricated and delivered to them (Zipkin, 2001, Squire, Brown, Readman, and Bessant, 2006). This is due to the integration of customers into the value chain. Depending on the type of mass customization (see section 2.4), customers are integrated before or during the production stage of a product. This integration prevents the MC company from having the product immediately physically ready (Bardakci and Whitelock, 2003). Thus, customers need to have the *"willingness-to-wait"* for their customized product (Bardakci and Whitelock, 2003: p. 470). These two drawbacks, however, can be considered by consumers before they even start customizing their product. They do not negatively affect the perceived value drivers presented before as those result from the customization process itself and thus require consumers' prior decision to actively engage in the customization activity.

"Mass confusion": the risk of choice overload

While and do not present a significant problem, a more serious threat to the value drivers of customization is the risk of choice overload for consumers. This issue has been termed as "*mass confusion"* within the academic field of mass customization (Teresko, 1994, Huffman and Kahn, 1998) and is caused by consumers' uncertainty about their own choices. Although some authors suggested ways to reduce this confusion (e.g., see Piller, Schubert, Koch, and Möslein, 2005, Chang and Chen, 2009), choice overload has been shown to negatively affect the satisfaction with the customized product (Matzler, Stieger, and Füller, 2011) and to reduce the perceived utility of mass customization (Dellaert and Stremersch, 2005). Reasons for this choice overload can either be traced back to consumers' missing preference insight or to the complexity of choices.

Consumers often lack precise knowledge about their own preferences. When they have to make a choice, they do not have clear pre-defined preferences but rather construct them *"on the spot"* (Slovic, 1995, Bettman, Luce, and Payne, 1998). Particularly in the context of customization this issue plays an important role, as it endangers the central value driver for customers: the increase in preference fit. How should consumers benefit from the possibility to align a product with their preferences if they do not know these preferences at all? This issue also appears in past literature: Franke et al. (2009) identified a negative effect of missing preference insight on the utilitarian value (preference fit) that consumers derive from mass customization. Likewise, Bharadwaj, Naylor, and ter Hofstede (2009) found that buyer's intention to repurchase customized systems was much higher when they were confident about their own preferences.

Recent research has shown that customization toolkits can serve as learning instruments for consumers to become acquainted with their own preferences and thus reduce the negative effect of missing preference insight. Especially consumers with ambiguous and unstable preferences are receptive to external influences and may adjust their preferences during customization (Simonson, 2005). Franke and Hader (2014) conducted an experiment in which they tested the impact of preference insight on the perceived value of customization. They measured the extent of participants' preference insight before using a toolkit, directly after usage and two weeks later. They identified a significant and stable increase in the level of subjects' preference insight, which was also

expressed in increased willingness-to-pay (Franke and Hader, 2014). Thus, these findings minimize the potential risk of missing preference insight in customization.

Choice overload can also be caused by choice complexity. This is particularly relevant for mass customization as it multiplies the number of consumers' required decisions. A vast amount of research in social psychology has shown that consumers' likelihood to purchase (i.e., to choose at all) and their satisfaction with their final choice is reduced when the number of options is increased (Iyengar and Lepper, 2000, Iyengar, Huberman, and Jiang, 2004, Diehl and Poynor, 2010, Kuksov and Villas-Boas, 2010). For example, in a field experiment in a supermarket Iyengar and Lepper (2000) provided two choice sets of gourmet jams to consumers, one set containing a limited selection of 6 different jams and the other one consisting of an extensive selection of 24 jams. While about 30% of the consumers in the limited condition bought a jam, this was true for only 3% in the extensive condition.

However, recent findings in the literature necessitate a more differentiated picture of choice overload, questioning the robustness of this effect (Scheibehenne, 2009). Several studies found contrary effects of choice set size on relevant dependent variables such as repurchase intention (Berger, Draganska, and Simonson, 2007) or sales (Borle, Boatwright, Kadane, Nunes, and Shmueli, 2005, Sloot, Fok, and Verhoef, 2006). Overall, in a meta-analysis of 50 experiments that deal with the phenomenon of choice overload, Scheibehenne, Greifeneder, and Todd (2010) found no significantly large effect. The study from Reutskaja and Hogarth (2009) provides a potential explanation: they identified a negative u-shaped relationship between choice set size and satisfaction, indicating that an optimal number of choices exists. Other scholars highlighted that customers' choice overload is not only caused by the number of options but also by additional characteristics such as the density and entropy of the choice set (Fasolo, Hertwig, Huber, and Ludwig, 2009) or the available time to make a decision (Haynes, 2009, Jessup, Veinott, Todd, and Busemeyer, 2009). These different findings show that the effect of choice overload remains unclear. Particularly in mass customization, choice overload, its related mechanisms, and the interaction with the identified value drivers need to be further analyzed.

2.6 Summary and main research gaps

In this chapter I provided the conceptual foundations of mass customization that are relevant for this thesis as well as a brief review of the existing literature. I derived a definition of the term *"mass customization"* and presented its evolution as well as its major components. In addition, I devised a comprehensive framework that allows the classification of different types of mass customization. Finally, I touched upon the product- and process-related benefits as well as the drawbacks of mass customization for consumers that have been identified by existing research.

The previous sections in this chapter highlight that the value of mass customization from consumers' perspective has to be viewed within a complex framework, consisting of various benefits on the one hand and considerable drawbacks on the other hand. However, consumers differ in terms of their personalities, their needs and preferences, and their attitude towards specific products. Assessing mass customization from the consumer perspective with consideration of these individual differences, ranging from consumers' general interest in customization over their preferences during customization to the perception of value after customization, is the central aim of this dissertation. Further elucidating the value of mass customization from the consumers' perspective has also been emphasized as a primary area for future research in a recent literature review by Fogliatto et al. (2012).

In light of the findings discussed above, it is likely that consumers' interest in customization varies individually, as the different value drivers presented above are not equally important for all consumers. Some support on this proposition can be found in past literature. Kaplan, Schoder, and Haenlein (2007) showed that the adoption of mass customization by consumers depends on two factors: the more frequently consumers purchase standard products from the same base category or the higher their satisfaction with these standard products is, the more likely they will buy a customized version of the product. Based on this finding the authors conclude that mass customization seems to be an appropriate approach specifically for existing satisfied customers. Similarly, Fiore et al. (2004) identified that consumers' motivation to use a mass customization system for apparel depends on the individual optimum stimulation level, which further indicates that interest in mass customization varies among consumers.

Furthermore, the underlying mechanisms of customers' choice behavior in the process of customization have barely been investigated. Although it has been proposed

that *"product customization influences consumer choices and evaluations in systematic ways"* (Valenzuela and Dhar, 2004: p. 685), it remains unclear how consumers' preferences influence their decisions during the process of customization. Particularly in light of the discussed value drivers such as uniqueness and recent propositions that consumers' decisions are not only affected by utility maximization but also by social aspects (McFadden, 2013), investigating choice behavior in mass customization under consideration of these factors is highly relevant.

Based on prior findings in the literature it is also likely that consumers do not benefit equally from mass customization. For example, Franke et al. (2009) showed that consumers' insight into their preferences, their ability to express these preferences, and the product involvement, positively affect the perceived preference fit of their customized product. Likewise, the positive effect of uniqueness on consumers' willingness-to-pay depends on consumers' desire for unique products (Franke and Schreier, 2008). The higher this desire is, the more likely consumers are willing to pay a price premium when they perceive their customized product as highly unique. Besides that, a study by Hunt et al. (2013) showed that the willingness to pay a price premium for customized products depends on consumers' individual need for uniqueness and optimization as well as the centrality of visual product aesthetics.

Although these studies provide first indications that individual differences between consumers exist, the real value of mass customization remains largely unstudied. Past research on individual differences in mass customization has focused on hypothetical settings (Hunt et al., 2013) or concentrated on identifying specific effects on single value drivers (Franke and Schreier, 2008, Franke et al., 2009). Moreover, all of the aforementioned studies only cover the positive outcomes in customization, but neglect to include potential drawbacks such as choice overload. Thus, drawing on the work from Fiore et al. (2004), Franke and Schreier (2008), Franke et al. (2009), and Hunt et al. (2013), I aim to shed light on the *real value* of mass customization by investigating consumer-specific determinants that affect the product and process value as well as the perceived overload and the purchase likelihood of customized products. In order to ensure external validity, this assessment has to take place in a real purchase environment amongst real users of a commercial mass customization system. Real-world validation has also been explicitly emphasized as a serious shortfall in the literature on mass customization so far (Fogliatto et al., 2012).

In summary, this dissertation aims to contribute to research on mass customization and consumer behavior by answering the following questions:

- What is the *general interest* of consumers in customization? For which types of consumers is it a valuable approach?
- How are *consumers' choices* in product customization influenced by their individual preferences?
- How do *consumer-specific antecedents* affect the perceived benefits and drawbacks for consumers in mass customization?

Before empirically investigating these questions, the following section provides an introduction to the general research methods applied in this thesis.

3 General method and research design

3.1 General research approach

There are three general approaches to social research: qualitative, quantitative, and mixed methods (Creswell, 2009). They differ by the strategy of inquiry, the methods applied and the general practices of research (Table 1). In general, a qualitative research approach is used to identify patterns from a limited set of observations and to develop hypotheses based on these findings (inductive reasoning, see Babbie, 2015). Interviews with open-ended questions or case studies are common practices in a qualitative approach. In contrast, a quantitative approach tests hypotheses that are derived from existing theories (Babbie, 2015), for example by deploying surveys or experiments (Creswell, 2009). While nascent research fields require the use of qualitative approaches, mature ones necessitate the application of a quantitative approach (Edmondson and McManus, 2007).

Mass customization shows characteristics of a mature field of research for two reasons. Firstly, a rich body of literature has evolved on this topic in the past two decades (Fogliatto et al., 2012). Secondly, most of the recent studies on the value of mass customization tested hypotheses quantitatively either in experiments or in surveys and utilized existing theories (e.g., see Franke et al., 2009, Franke et al., 2010b, Norton et al., 2012, Hildebrand, Häubl, Herrmann, and Landwehr, 2013a, Hunt et al., 2013, Franke and Hader, 2014). These aspects are common characteristics for mature research streams (Edmondson and McManus, 2007).

Table 1: Approaches to social research

Criterion	Qualitative approach	Quantitative approach	Mixed method approach
Strategies of inquiry	Grounded theory, case study	Surveys and experiments	Sequential, concurrent, and transformative
Methods	Open-ended questions, text or image data	Closed-ended questions, numeric data	Both open- and closed-ended questions, both quantitative and qualitative data
Practices of research	Focus on single phenomenon Collection of participant meanings Integration of personal values Interpretation of data	Theory testing or verification Identification of variables and setting them into relation Numerical measurement and observation of information Use of statistical procedures	Development of rationale for mixing Employment of both practices (quantitative and qualitative)

Source: adapted from Creswell 2009

Besides that, some of the central research questions of my thesis (see section 2.6) focus on elucidating recent trends with the aim to bridge research interests from the areas of mass customization, consumer psychology, and marketing. These criteria describe the nature of phenomenon-based research, which particularly deals with problems that are not fully covered by existing theories but are highly relevant to both research and management practice (von Krogh, Rossi-Lamastra, and Häfliger, 2012).

Consequently, I employ a quantitative research approach in this dissertation by utilizing two different quantitative strategies of inquiry, surveys and experiments (Creswell, 2009). In chapters 4 and 6 of my thesis I apply a phenomenon-based research approach by implementing survey methodology. In chapter 5 I use a theory-based research approach and conduct a series of experiments for the testing of my hypotheses. In the following section I provide a brief overview of these two strategies of inquiry as well as the reasoning for mixing these two strategies in my dissertation.

3.2 Strategies of inquiry

3.2.1 Survey research

Survey research is a *"structured approach to data collection and analysis"* (De Vaus, 2002: p. 7). In general, it utilizes self-administered questionnaires that are sent out to a sample of respondents (Bailey, 2008). The primary goal of a survey is to receive information about a target population. To achieve this goal, surveys need to fulfill two central premises (Fowler Jr, 2009):

1. The sample of respondents needs to reflect the actual target population.
2. The answers in the survey need to objectively represent the characteristics of the respondents.

Researchers who utilize surveys need to bear in mind that these two premises are threatened through various errors that can occur. The first premise can be affected either by a random sampling error (e.g., overrepresentation of male respondents compared to the statistics of the target population) or by an unintentionally created response bias (e.g., leaving out an important group of respondents). If one of these errors is present, the characteristics of the sample might not match those of the target population (Fowler Jr, 2009). The second premise can be infringed by a distortion in the responses of the participants (Fowler Jr, 2009), meaning that there is a difference between the answer given by an individual and the true value for this person. This creates an unwanted bias in the results, which can have multiple sources (Podsakoff and Organ, 1986, Krosnick, 1999) such as social desirability (respondents select those answers they believe to be socially approved) or desire for consistency (participants try to be consistent between similar questions and thus adjust their responses accordingly). This is particularly an issue when attitudes of individuals are measured via self-administered questionnaires (Schwarz, 1999). As the research model in section 6 of my thesis includes variables such as consumers' attitudes towards their customized product, I have to address these potential issues in order to confirm the validity of my findings.

In order to consider these risks in survey research, results need to be tested for common method variance (CMV). CMV represents the *"variance that is attributable to the measurement method rather than to the construct of interest"* (Podsakoff, MacKenzie, Lee, and Podsakoff, 2003: p. 879). It describes the phenomenon that the strength of a

relationship between variables is amplified or weakened due to a specific response pattern among survey participants as highlighted above. Although the magnitude of this issue has been questioned by scholars (Crampton and Wagner, 1994, Spector, 2006), research suggests the necessity of a critical investigation of this potential issue particularly for surveys that do not use different sources for the dependent and the independent variables (Podsakoff et al., 2003).

Different post-hoc statistical tests exist to assess the impact of CMV (Lindell and Whitney, 2001, Malhotra, Kim, and Patil, 2006, Chang, Van Witteloostuijn, and Eden, 2010). The most frequently established technique is the Harman's single factor test, which tests using a confirmatory factor analysis (CFA) whether the majority of the variables' variance can be explained by only one common factor (Malhotra et al., 2006). However, the validity of this test is presumed to be rather limited (Podsakoff et al., 2003). Particularly, when a large number of factors is included in the model, the likelihood of only one factor accounting for the majority of the variance strongly decreases (Podsakoff et al., 2003, Malhotra et al., 2006). Thus, it is advisable to conduct an additional test for common method variance by introducing a latent common methods variance factor and measuring the significance of the parameters with and without this variable (Podsakoff et al., 2003, MacKenzie and Podsakoff, 2012). As my model in section 6 of the thesis includes a relatively large number of variables, I do not only conduct Harman's single factor test but also employ the latter technique to test for common method variance.

3.2.2 Experimental research

Although research on innovation has largely neglected the application of experiments to date (Sørensen, Mattsson, and Sundbo, 2010), it is seen as the most appropriate approach to test a theory (Campbell and Stanley, 1963, Edmondson and McManus, 2007, Willer and Walker, 2007). It is particularly applicable to research projects that investigate causal relationships between a limited amount of variables (Highhouse, 2007, Babbie, 2015).

Experiments can be classified by two general characteristics, the underlying experimental design and the environment in which they take place. Experimental designs in turn are differentiated by the number of factors (independent variables) that are included (Boniface, 1995). In the case of a single-factor design (i.e. only one

independent variable), the experiment generally includes two groups of subjects: one that receives the experimental stimulus (treatment group) and one that does not (control group). The control group is important to reveal any effects from the experiment itself (e.g., an unintended increase or decrease of a measured variable through the artificial setting of an experiment) and to protect against the distortion by any unmeasured external factors (Babbie, 2015). In the case of a factorial design, the total number of experimental groups results from multiplying the different levels of all variables (Boniface, 1995, Babbie, 2015). For example, two variables, one with two levels (yes/no) and one with three levels (low/medium/high) would yield to a 2x3 factorial design with six experimental groups to cover all treatment conditions. Factorial designs allow for smaller sample sizes than single-factor experiments (Maxwell and Delaney, 2004) and thus are particularly suitable for experiments with multiple factors but only a limited number of subjects. In section 5 of this dissertation, I use a single-factor-between-subjects design to test the choice behavior of the participants during the process of customization.

Besides their design, experiments can also be categorized into laboratory and field experiments. While laboratory experiments take place in an artificially created setting, field experiments are conducted *"out in the real world"* (Babbie, 2015: p. 238). A special form of the field experiment is the natural experiment (Babbie, 2015), in which the treatment can be observed naturally without manipulation of the researcher (for example, the occurrence of a financial crisis in a country would be a natural treatment). Laboratory and field experiments have different advantages and disadvantages. On the one hand, laboratory settings give researchers more control over the experiment (Jackson and Cox, 2013) and thus fulfill the *ceteris paribus* condition (Cook and Campbell, 1979), i.e. they allow researchers to randomly assign subjects to a condition of the independent variable which eliminates the problem that any unmeasured variables are significantly correlated with the independent variable (James, 1980, Colquitt, 2008). On the other hand, laboratory experiments specifically bear the threat of missing external validity (Creswell, 2009, Jackson and Cox, 2013): the experimental results might not be transferable to the real environment due to the controlled artificial setting. However, Anderson, Lindsay, and Bushman (1999) identified a high correlation (0.73) between the effect size of laboratory and field experiments, indicating a high degree of external validity of laboratory experiments. This finding is important as it provides

further support for the external validity of my findings from the laboratory experiment in section 5 of my dissertation.

3.2.3 Application of research designs in the thesis

For this dissertation, I mix both strategies of inquiry by utilizing surveys and experiments. I conduct surveys in part I and III whereas I employ a series of experiments to elucidate the research objective of part II. This is appropriate as the research objectives differ between the three central parts of my thesis and I adjusted the research design to fit these objectives, which are outlined below.

In part I of my dissertation, I aim to understand consumers' interest in customization and attempt to clarify whether this interest is related to a general set of personality traits. In order to gain an effective view on these questions, a broad sampling of respondents with different characteristics (e.g., age, gender, educational degree, and personality) is required. This is the main advantage of a cross-sectional survey design, which allows receiving information from a diverse pool of participants at a specific point in time (Bailey, 2008). Therefore, I utilize a cross-sectional online survey to shed light on the research objective of part I.

By contrast, the research objective of part II is to understand the relationship between consumers' choice behavior in mass customization and their individual needs. The research model of this part is based on well-established theories from social psychology and focuses on determining effects between a limited set of variables. To identify this effect, two primary requirements need to be fulfilled: First, the research design needs to allow the observation of different states of this effect (i.e. presence vs. absence of the hypothesized effect), and second, frame conditions need to be comparable across these different states. These requirements are met by laboratory experiments as they enable researchers to carve out a specific hypothesized effect by actively manipulating the independent variable (the experimental stimulus or *treatment*) and by simultaneously controlling for other factors that influence the relationship between the dependent and independent variables (Willer and Walker, 2007, Babbie, 2015). By setting up an experiment, I am able to induce different manipulations to the experimental groups and observe the impact on consumers' choice behavior. Moreover, due to the *ceteris paribus* condition mentioned above (Cook and Campbell, 1979), groups in laboratory experiments are supposed to have comparable

characteristics, given that participants are randomly assigned to them. These criteria highlight that an experimental design is the appropriate approach to answer the research objective of part II.

In part III of my dissertation, I am interested in assessing the real benefits of mass customization from a consumer perspective. Again, I utilize survey research for this part. Three reasons made me choose this strategy of inquiry. Firstly, in order to determine the real value, perceptions and attitudes from actual users of a mass customization system need to be explored. Measuring these perceptions and attitudes requires to survey users who have already been engaged in product customization. Secondly, the research model that I develop in part III comprises a multitude of variables. In contrast to experiments, surveys allow the generation of large sample sizes. Thus, this method is particularly useful for research models and analyses that incorporate many variables (Babbie, 2015). Thirdly, I aim to collect information about different consumer characteristics. Due to the sample size surveys are also an appropriate means for measuring a broad spectrum of the characteristics of a population or sub-group of it (Babbie, 2015), which therefore provides further support for conducting a survey in this part of the thesis.

The following three sections (4, 5 and 6), cover the core parts of my thesis, assessing the consumer perspective of mass customization. I begin in section 4 by determining consumers' general interest in customization. Then I move on to investigate the actual choice behavior of consumers during customization in section 5. Finally, in section 6, I cover consumer-specific antecedents of the perceived value by surveying real users of an established customization system.

4 Part I: Consumers' experience and interest in mass customization

4.1 Introduction and theoretical background

4.1.1 Introduction

As illustrated in section 1.1, mass customization has gained increased attention by researchers in the past two decades (Fogliatto et al., 2012) and has also considerably expanded into different industries (Moser and Piller, 2006, Walcher and Piller, 2012). Accordingly, research identified a multitude of benefits of customized goods from a consumer perspective (e.g., see Schreier, 2006, Franke et al., 2009, Franke and Schreier, 2010, Merle et al., 2010). However, research has also begun to critically review this business approach (Huffman and Kahn, 1998, Squire et al., 2004) and has highlighted the drawbacks for consumers (Zipkin, 2001). Some scholars point out that mass customization is a valuable approach for experts who possess advanced knowledge about their own preferences but not for novices who have no insight into their own preferences (Simonson, 2005, Bharadwaj et al., 2009). Two central aspects have so far not been addressed in this controversial discussion:

1. Apart from the increasing presence and attention in research, how widespread is mass customization amongst consumers in reality?
2. To what extent are consumers generally interested in mass customization and what determines this interest?

Particularly assessing the interest of consumers in mass customization is crucial as the benefits of customization can only take effect for those consumers who give mass customization a try. Thus, in this section of the dissertation I investigate consumers' past experience with customization and their interest in mass customization depending on the product domain as well as personality factors.

Interest in customization may be influenced by two different criteria. On the one hand, this interest might be contingent on the product domain. As stated in section 2.3.2,

mass customization is particularly beneficial when consumer needs are heterogeneous (Franke and von Hippel, 2003, Franke and Piller, 2004). Thus, interest may vary across different product domains. Heterogeneity of needs should be particular present in two general product types. Products with many functional components such as computers and automobiles allow consumers to optimize the utility derived from this product (i.e. the preference fit), which past research identified as a major driver of value in customization (Franke et al., 2009). Besides this, identity-signaling products imply a higher divergence in tastes (Berger and Heath, 2007). Thus, particularly these product domains should allow the satisfaction of the consumers' need for uniqueness or self-expression, which are both important value drivers in customization (Franke and Schreier, 2008, Merle et al., 2010). Hence, fashion products such as clothes or sports shoes that are highly identity-related (Berger and Heath, 2008), should also bring with them an increased interest in customization.

On the other hand, interest in customization may be influenced by consumers' personalities. For example, past research identified that consumers with high optimum stimulation levels are more willing to use a mass customization system (Fiore, Lee, Kunz, and Campbell, 2001, Fiore et al., 2004). To gain a holistic view on the personality-specific determinants of interest in customization, a universal measurement of personality needs to be applied. The most common instrument for measuring personality is the Big Five inventory (Goldberg, 1990), which allows the classification of every individual along five major personality traits.

To shed light on the questions raised above, I conduct an online survey among 150 participants. Results show that consumers' experience and interest in customization is high, indicating that mass customization has reached consumers. However, the interest indeed depends on the product category and is particularly strong for functional products such as cars and laptops, or for aesthetics goods such as shirts and shoes. The survey also points out that consumers' interest in customization depends on two of the Big Five personality traits, namely openness to experience and extraversion. These findings imply that the attractiveness of mass customization not only depends on objective characteristics such as the product type or the brand, but also varies among different types of consumers.

4.1.2 Background on the five-factor model ("Big Five")

The most prevalent and established classification of personality traits in social psychology is the five-factor model (FFM), which has been coined as the *"Big Five"* by Goldberg (1990). The model is based on the work of Tupes, Christal and Norman (Tupes and Christal, 1961, Norman, 1963) and comprises the following five personality factors (Goldberg, 1993, John and Srivastava, 1999): openness, conscientiousness, extraversion, agreeableness, and neuroticism. Table 2 gives an overview of the personality factors and their characteristics. The five-factor model has been empirically validated across numerous research settings and is seen as a universal scheme to measure different personality traits in a comprehensive way (McCrae and John, 1992, Roccas, Sagiv, Schwartz, and Knafo, 2002). Thus, it also provides an appropriate basis for classifying consumers in mass customization.

Table 2: Overview of the Big Five personality traits

	Individuals with high values are…	**Individuals with low values are…**
Openness to experience	intellectual, sensitive, open-minded	down-to-earth, insensitive, conventional
Conscientiousness	careful, responsible, organized	irresponsible, disorganized, unscrupulous
Extraversion	sociable, talkative, assertive	reserved, cautious, retiring
Agreeableness	compliant, gentle, cooperative	inflexible, ruthless, irritable
Neuroticism	anxious, angry, insecure	calm, poised, emotionally stable

Source: adapted from Roccas et al. 2002

4.2 Method and measurement

To answer the questions raised above, I conducted a survey in Amazon Mechanical Turk (MTurk). MTurk is an US-based online platform that provides access to a large and diverse workforce to solve human intelligence tasks (HITs). In total, 150 participants responded to the survey (average age: 35.4 years; 50.7% females). The majority of participants (86.7%) came from the United States. One has to bear in mind that the survey results might not be fully representative. The described sample of participants may predominantly include participants with a high affinity to technology as MTurk is a

platform that exclusively provides online tasks to users. However, as mass customization is mostly implemented via web-based toolkits and thus requires a certain degree of technological affinity of its users, I regard the sample as adequate. Moreover, data obtained via MTurk, including the Big Five inventory, has been shown to be as reliable as those collected from other sources (Buhrmester, Kwang, and Gosling, 2011).

Experience. To collect information on the past experiences of the survey respondents, two items from the scale by Franke and Hader (2014) were applied (I am familiar with these kinds of configurators. I often use these kinds of configurators.). In addition to this, survey participants were asked about the number of products they have customized in the past three years.

Interest. To assess the interest in customization, respondents were asked to rate their general interest in customizing products with online product configurators on a seven-point Likert scale (*"Please rate your general interest in customizing products with online product configurators"*, ranging from 1 = not interested at all to 7 = very interested). As proposed by Sackett and Larson (1990), a single-item scale was used because of the single-dimensionality and unambiguity of the scope of this construct. The predictive validity of such single-item measures has been empirically proven to be equal to those of multi-item measures (Bergkvist and Rossiter, 2007).

Big Five personality traits. I measured the Big Five personality traits with the BFI-10 scale (Rammstedt and John, 2007). The BFI-10 is a short version of the standard 44-item scale (John and Srivastava, 1999) and consists of 10 items (two items per personality trait). The predictive capability of the BFI-10 is presumed to be comparable to the standard 44-item scale (Thalmayer, Saucier, and Eigenhuis, 2011).

Reliability of the scales is assessed by the Spearman-Brown coefficient ρ_{SB}, which is regarded as the most appropriate measurement for scales that consist of only two items (Eisinga, Grotenhuis, and Pelzer, 2012). Except for agreeableness (ρ_{SB} = 0.577), the coefficient of all Big Five personality traits exceed the acceptable threshold of 0.6.

Table 3: The BFI-10 scale

	I see myself as someone who…	Spearman-Brown coefficient ρ_{SB}
Openness to experience	…has few artistic interests (R)	0.640
	…has an active imagination	
Conscientiousness	…tends to be lazy (R)	0.665
	…does a thorough job	
Extraversion	…is reserved (R)	0.811
	…is outgoing, sociable	
Agreeableness	…is generally trusting	0.577
	…tends to find fault with others (R)	
Neuroticism	…is relaxed, handles stress well (R)	0.840
	…gets nervous easily	

R: Reversed scoring; source: Rammstedt and John 2007

4.3 Findings[14]

4.3.1 Consumers' past experience with customization

As well as the number of customized products they purchased in the past 3 years, I asked participants about their general experience with product configurators. On average, participants state that they have a moderate to high experience with product configurators (M = 4.48; SD = 1.47; ρ_{SB} = .799). 60.7% of the respondents already purchased a customized product; thereof 34.7% bought two or more customized products (Figure 7). The most frequently customized products are computers and laptops (36.3%), shoes (33.0%), and shirts (27.5%). A t-test is conducted in order to compare the experience with customization between males and females. Results indicate that the means of both groups are not significantly different (M_{Males} = 4.45; SD_{Males} = 1.50; $M_{Females}$ = 4.50; $SD_{Females}$ = 1.45; t = -0.197; n.s.).

[14] Some of the descriptive findings presented section 4.3.1 and 4.3.2 have already been published in Hagenmaier, M., Preißner, S., Raasch, C., and Zaggl, M. A. (2014).

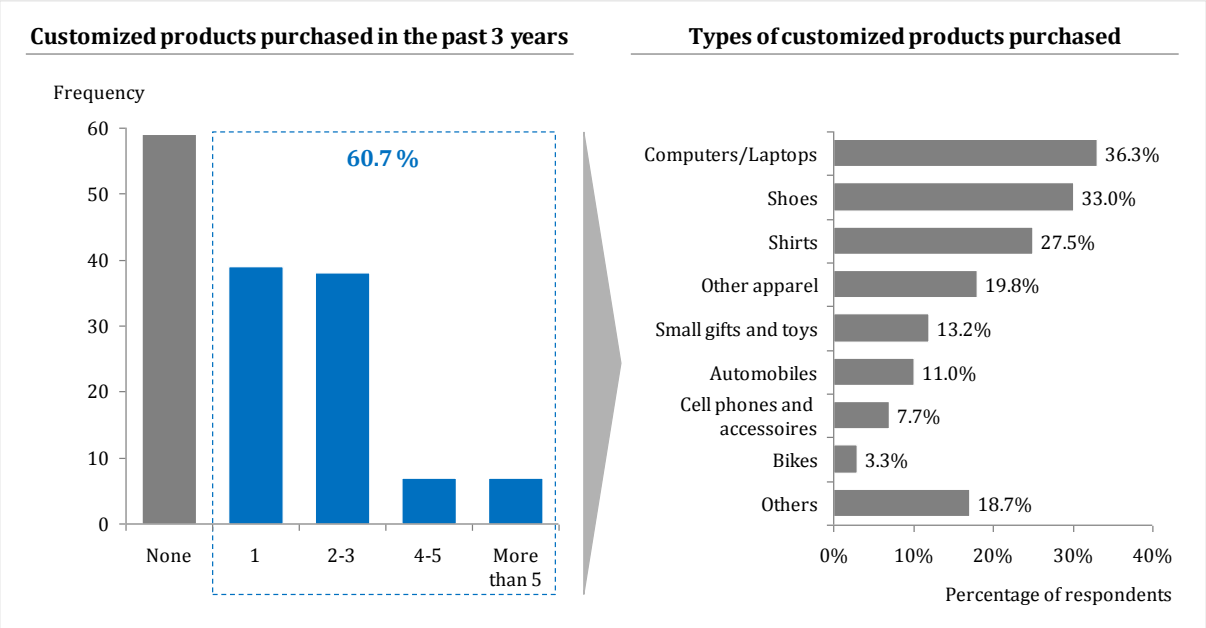


Figure 7: Past experience of consumers with mass customization (n=150)

4.3.2 Consumers' general interest in mass customization

In addition to their experience, respondents were also asked about their general interest in customization. The majority of the participants (74.7%) state a high to very high interest in customization (M = 5.16; SD = 1.32). However, interest varies across different product categories. Participants were able to make multiple choices in a given set of product types, which was based on the most common product categories for customization from the configurator database[15] (Figure 8). Interest in customization is particularly high for clothes (100 votes; 66.7%), laptops (85 votes; 56.7%), and automobiles (73 votes; 48.7%). Only few respondents are interested in customizing cereals/food (9 votes; 6.0%) and skis or snowboards (8 votes; 5.3%).

I also test for differences between male and female consumers. Therefore, I again compare the means of respondents' interest by conducting a t-test. No significant difference in means between male and female respondents can be identified ($M_{Males} = 5.11$; $SD_{Males} = 1.46$; $M_{Females} = 5.21$; $SD_{Females} = 1.17$; $t = -0.475$; n.s.). However, gender-specific differences exist in some of the product categories. Male respondents show particular interest in customizing bikes (23 males vs. 11 females; $\chi^2 = 7.745$; $p < .01$) and laptops (49 males vs. 36 females; $\chi^2 = 9.805$; $p < .01$). By contrast, female respondents prefer to customize jewelry (14 males vs. 41 females; $\chi^2 = 16.435$; $p < .001$)

[15] http://www.configurator-database.com/; last website access: 07.04.2015, 15:13.

and beauty products (2 males vs. 20 females; $\chi^2 = 14.889$; $p < .001$). For the other categories such as clothes, sports shoes, and automobiles, interest in customization is not significantly different between male and female respondents[16].

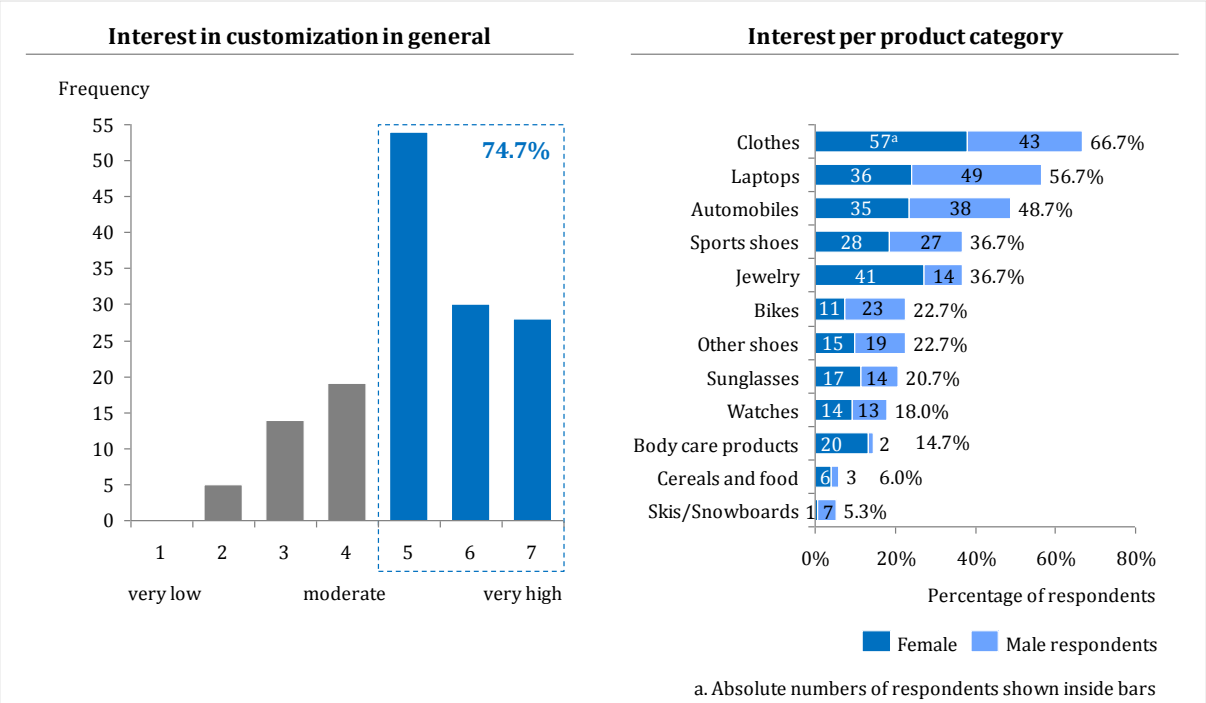


Figure 8: Interest in customization (n=150)

4.3.3 Personality traits as determinants of interest in customization

Next, I investigate the relationship between the interest in mass customization and the respondents' personality traits, namely extraversion ($M = 3.65$; $SD = 1.73$), agreeableness ($M = 4.84$; $SD = 1.51$), conscientiousness ($M = 5.46$; $SD = 1.27$), neuroticism ($M = 3.42$; $SD = 1.79$), and openness ($M = 5.17$; $SD = 1.42$). Three out of five personality traits significantly positively correlate with respondents' interest (Table 4): openness to experience ($\rho = 0.17$; $p < .05$), conscientiousness ($\rho = 0.16$; $p < .05$), and extraversion ($\rho = 0.26$; $p < .01$).

[16] For the categories cereals and skis/snowboards differences in interest between males and females cannot be statistically tested as the number of votes is too low to conduct chi-square tests (the expected cell count is below the threshold value).

Table 4: Correlations, means, and standard deviations

	Variable	Mean	SD	1	2	3	4	5	6	7	8	9
1	Interest in customization	5.16	1.32									
2	Experience with custom.	4.48	1.47	0.44***								
3	Openness to experience	5.17	1.42	0.17*	-0.06							
4	Conscientious-ness	5.46	1.27	0.16*	0.18*	0.10						
5	Extraversion	3.65	1.73	0.26**	0.09	0.18*	0.27***					
6	Agreeableness	4.84	1.51	0.15	0.13	-0.03	0.22**	0.36***				
7	Neuroticism	3.42	1.79	-0.15	-0.14	-0.05	-0.38***	-0.35***	-0.51***			
8	Gender	0.51	0.50	0.04	0.02	-0.02	0.06	-0.10	-0.10	0.27***		
9	Age	35.39	10.66	-0.09	-0.14	0.02	0.12	0.16	-0.01	-0.16*	0.17*	
10	Educational degree	2.72	0.69	0.12	0.09	0.06	0.10	0.17*	-0.02	-0.13	0.08	0.11

n = 150
* p < .05 (two-tailed test)
** p < .01 (two-tailed test)
*** p < .001 (two-tailed test)

In order to further assess the relationships between the Big Five and consumers' interest in customization, a hierarchical multiple regression model is applied, with consumers' interest in customization as a dependent variable.

Multiple regressions require testing of several underlying assumptions: linearity, normality of data distribution, multicollinearity, homoscedasticity and normality of the distribution of the residuals (Hair, Black, Babin, Anderson, and Tatham, 1998, Cohen, 2003, Bortz, 2005). Linearity can be assessed by visually reviewing the scatter plots of the dependent variable and the independent variables (Cohen, 2003). Figure 9 depicts the relationships between these variables. As linearity cannot be confirmed by visual inspection, I conduct an additional test for linearity between the interest and the Big Five traits. All five tests are significant on 10% level or higher ($F_{INT \times OPN} = 4.555$; $p < .05$; $F_{INT \times CON} = 4.097$; $p < .05$; $F_{INT \times EXT} = 11.579$; $p < .001$; $F_{INT \times AGR} = 3.703$; $p < .1$; $F_{INT \times NEU} = 3.237$; $p < .1$), which confirm a sufficient level of linearity in the data.

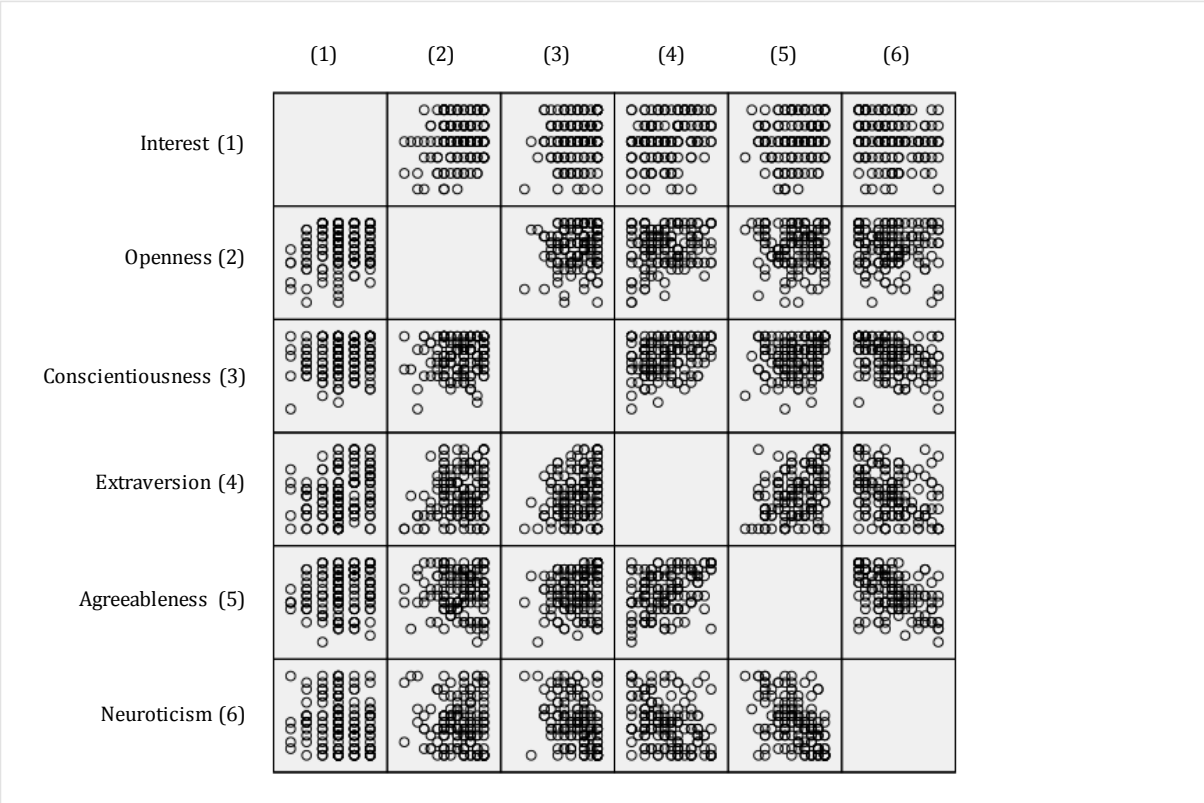
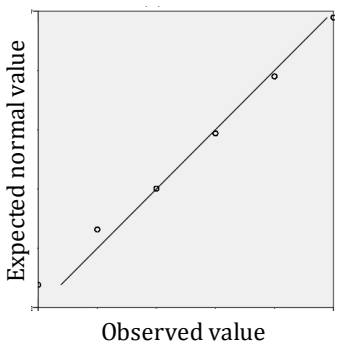
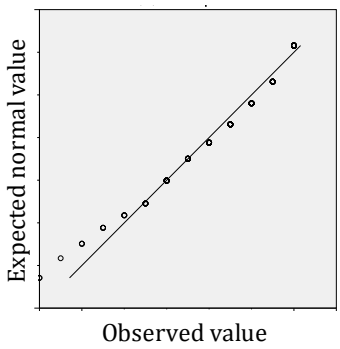
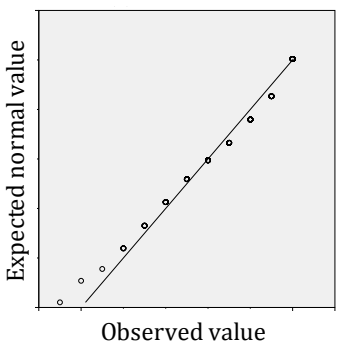
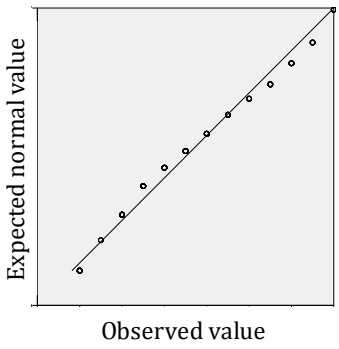
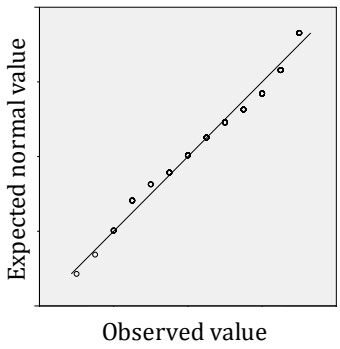
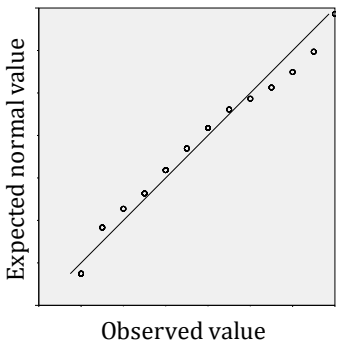


Figure 9: Analysis of linearity for main variables

Another central criterion for regressions is that data are normally distributed (Bortz, 2005). To test normality of distribution, I conduct Kolmogorov-Smirnov tests. As the tests yield to significant results for all variables ($p < .001$) indicating non-normality, I visually inspect the distributions of the variables as well as their skewness and kurtosis (Table 5). Skewness indicates to what extent the distribution is shifted to the right or to the left whereas kurtosis signals how much the distribution is flattened or culminated compared to normality (Breakwell, Hammond, Fife-Schaw, and Smith, 2006). All of the values for skewness and kurtosis are within the range of -1.0 and +1.0, which is regarded as an indication for being sufficiently close to a normal distribution (Breakwell et al., 2006). Visual inspection provides further support that deviation from normal distribution is within an acceptable range, as the dotted lines only slightly diverge from the straight continuous lines in all three diagrams.

Table 5: Analysis of normality for main variables

	Interest	Openness	Conscientiousness
Normal Q-Q plot			
Skewness	-0.407	-0.653	-0.589
Std. Error	0.198	0.198	0.198
Kurtosis	-0.330	0.010	-0.308
Std. Error	0.394	0.394	0.394
	Extraversion	**Agreeableness**	**Neuroticism**
Normal Q-Q plot			
Skewness	0.266	-0.336	0.422
Std. Error	0.198	0.198	0.198
Kurtosis	-0.896	-0.828	-0.777
Std. Error	0.394	0.394	0.394

n = 150

In multiple regression analyses it is also essential to test for multicollinearity (Hair et al., 1998, Cohen, 2003). Multicollinearity describes the phenomenon that two or more predictor variables are highly correlated. Although it does not affect the predictive power of the model, it might affect the results for the individual variables. To test the degree of multicollinearity, the tolerance ($1-R^2$) as well as the variance inflation factors ($1/(1-R^2)$) for each of the variables in the regression have to be inspected. If the tolerance value is below 0.1 or if the variance inflation factor exceeds 10,

multicollinearity exists (Cohen, 2003). None of the variables has a variance inflation factor above 1.8, indicating that multicollinearity is not present in this study (Table 6).

Table 6: Test for multicollinearity

	Tolerance	Variance inflation factor
Age	0.857	1.166
Gender	0.832	1.202
Educational degree	0.923	1.084
Experience with customization	0.913	1.095
Openness to experience	0.944	1.060
Conscientiousness	0.789	1.267
Extraversion	0.744	1.345
Agreeableness	0.664	1.506
Neuroticism	0.561	1.784

n = 150

As the other two assumptions (homoscedasticity and normal distribution of residuals) have to be tested ex post, results of the hierarchical multiple regression are described next. Model 1 includes the control variables age, gender, educational degree and experience with customization ($F_1 = 9.347$; $p < .001$; $R^2 = 0.205$). In model 2, the five personality traits from the BFI-10 scale are added as additional independent variables ($F_2 = 6.225$; $p < .001$; $R^2 = 0.286$). The dependent variable of both models is consumers' interest in customization. Two out of the five personality traits turn out to be significant predictors of consumers' interest in mass customization (Table 7). The stronger the personality traits openness to experience and extraversion are, the higher the interest in customization is ($ß_{OPN} = 0.162$; $SE_{OPN} = 0.074$; $p < .05$; $ß_{EXT} = 0.190$; $SE_{EXT} = 0.083$; $p < .05$). To assess the effect size of openness to experience and extraversion, I calculated Cohen's f^2 for both variables. Results ($f^2_{OPN} = 0.035$; $f^2_{EXT} = 0.038$) indicate small effect sizes (Cohen, 1988). The other three personality traits do not significantly influence consumers' interest in customization. However, I also find a moderate positive effect of respondents' past experience with customization on their interest ($ß_{EXP} = 0.429$; $p < .001$; $f^2_{EXP} = 0.21$), indicating that consumers who customized a product in the past are more strongly interested in customization.

Table 7: Hierarchical multiple regression results (DV: interest in customization)

	Model 1: Control variables			Model 2: Personality traits		
	ß	**Std. Error**	**T-value**	**ß**	**Std. Error**	**T-value**
Age	-0.048	0.076	-0.622	-0.093	0.077	-1.203
Gender	0.034	0.075	0.445	0.078	0.078	0.991
Educational degree	0.081	0.075	1.073	0.038	0.074	0.506
Experience with customization	0.429	0.075	5.695***	0.409***	0.075	5.471
Openness to experience				0.162	0.074	2.206*
Conscientiousness				0.008	0.080	0.102
Extraversion				0.190	0.083	2.300*
Agreeableness				0.029	0.088	0.334
Neuroticism				-0.030	0.095	-0.319
F full model			9.347***			6.225***
R^2			0.205			0.286
Adjusted R^2			0.183			0.240

n = 150; standardized coefficients are shown
* p < .05
** p < .01
*** p < .001

Finally, homoscedasticity and normal distribution of residuals are assessed. Again, a Kolmogorov-Smirnov test is conducted and the q-q plot is visually investigated to test for normal distribution of residuals. Test results are insignificant (p = .200). Hence, residuals are normally distributed, which is also supported by the q-q plot (Figure 10). Homoscedasticity describes the constant variance of the error terms of the dependent variable and is inspected by plotting the predicted values of the variable against the variable's residuals (Hair et al., 1998).

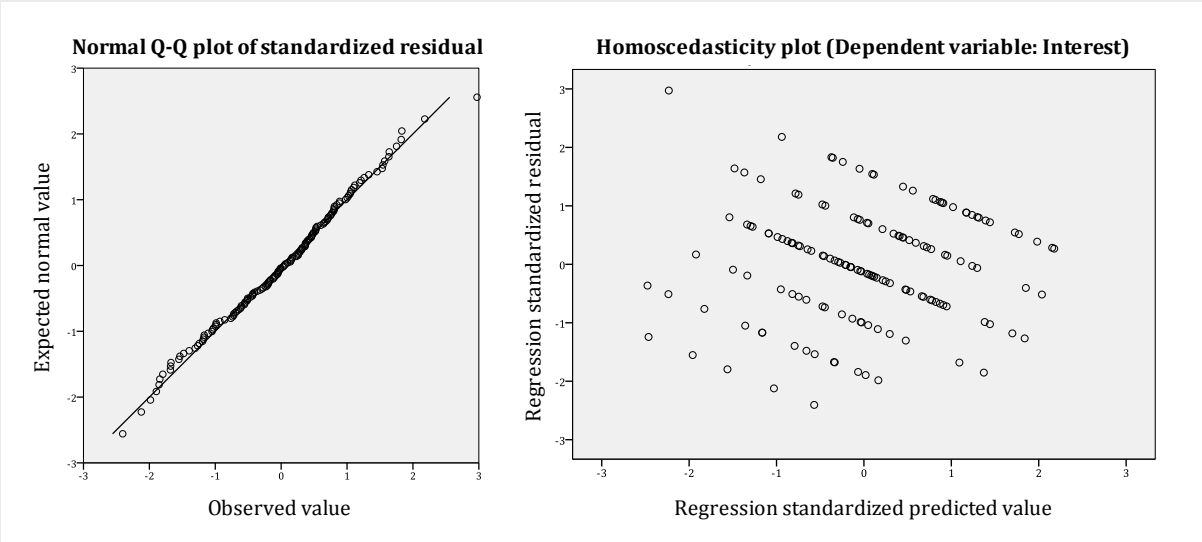


Figure 10: Analysis of regression residuals of dependent variable

As homoscedasticity cannot be confirmed by visual inspection of the plot (Figure 10), a Breusch-Pagan test is conducted to test for heteroscedasticity (Breusch and Pagan, 1979). The test is significant at a 5% level ($\sigma_t^2 = 17.009$; $p = .049$), indicating heteroscedasticity of the error terms. As heteroscedasticity might affect significance levels of the regression, I follow the procedure of Hayes and Cai (2007) and calculate heteroscedasticity-consistent standard error estimators. I re-run the regression described above with these estimators in order to test for differences in significance. Results are very similar to the original regression, still supporting my findings that openness to experience and extraversion are significant predictors of respondents' interest in customization ($\beta_{OPN} = 0.162$; $SE_{OPN} = 0.076$; $p < .05$; $\beta_{EXT} = 0.191$; $SE_{EXT} = 0.077$; $p < .05$).

4.4 Discussion

With this study, I shed light on consumers' past experience with mass customization, their interest in this business approach, as well as determinants of this interest. The majority of respondents are highly interested in customization and almost two thirds have customized one or more products in the past. The level of interest differs between product categories and is particularly high for clothes, computers/laptops, automobiles, sports shoes, and jewelry. Moreover, results indicate

that consumers' openness to experiences in general and an extraverted personality positively affect their interest in customization.

My findings indicate that customization can no longer be considered as a niche phenomenon. This is in line with recent literature (Fogliatto et al., 2012, Franke and Hader, 2014). However, a differentiated view on the attractiveness of mass customization for consumers is required as their experience and interest depends on their gender and the type of product. Literature has emphasized that particularly in areas where consumers' needs are heterogeneous, mass customization can be beneficial (Salvador et al., 2009). Based on the results of this study, both male and female consumers' needs seem to be especially heterogeneous in the apparel and automobile markets. Furthermore, the preferences of male consumers seem to be heterogeneous regarding computers and laptops whereas this seems to be true for female consumers choosing jewelry.

Based on the product preferences stated by the respondents, offering customization seems to be particularly beneficial for two types of products, either comprising a large number of functional parameters such as laptops or cars, or including aesthetic features such as apparel. This also seems reasonable with respect to the major value drivers in mass customization (see section 2.5). On the one hand, consumers particularly value the increase in utility of their customized product (Franke et al., 2009). This increase might be particularly relevant in products with many functional parameters, as utility is substantially influenced by these parameters. On the other hand, uniqueness is an additional value driver in customization (Franke and Schreier, 2008). Thus, consumers might be particularly interested in customizing aesthetic products as this provides the opportunity for personal differentiation from others.

Moreover, this study indicates that consumers' interest in mass customization is positively related to two of the Big Five personality traits, namely openness to experience and extraversion. This might be due to the motivational goals that are associated with these two personality traits. Openness to experience positively correlates with a person's motivational goal of stimulation such as excitement (Roccas et al., 2002). Customization has been shown to evoke excitement in consumers due to the ability to create their ideal product (Dellaert and Dabholkar, 2009). In accordance with this literature, this study shows that consumers with high scores in openness to experience are particularly interested in customization, because customizing their product might help to satisfy their motivational goal of excitement. Likewise,

extraversion positively correlates with the motivational goals of hedonism and achievement (Roccas et al., 2002). According to findings in past research on value drivers of customized products (see also section 2.5.3 for details), consumers enjoy the design process (Franke and Schreier, 2010) and are also proud of their creative achievement (Franke et al., 2010b). In this study, extraverted respondents showed higher interest in customization. Based on this finding and the literature, extraverted consumers might be more interested in customization because they expect to be able to satisfy their motivational goals of hedonism and achievement.

Finally, I identified a significant influence of past experience with customization on consumers' interest. This finding indicates that either interest in customization is increased by a (positive) experience in the past or the pre-existent interest in customization increased the likelihood that respondents purchased a customized product in the past. Furthermore, simultaneous causality might prevail in this case, leading to an issue of endogeneity (Semadeni, Withers, and Certo, 2014). However, the interaction between both variables is outside of the scope of the present study.

4.5 Contributions and limitations

With this study I expand knowledge about mass customization. By identifying that both interest in and past experience with mass customization is high among the respondents of my survey, I highlight the relevance of this research stream and show that mass customization is already a widespread business approach. Therefore, this study supports propositions by Fogliatto et al. (2012) and Franke and Hader (2014) that mass customization has lost its status as a niche phenomenon. However, this study is limited to a small group of respondents that mainly come from the United States and may also show a higher than average affinity to using web-based technologies. As this might affect the representativeness of the results, it would be necessary to extend this study to a larger number of consumers and to other countries or cultures, as consumption behavior has been shown to differ between those (Lee, Pant, and Ali, 2010).

As I also find that consumers' interest in customization differs between product categories and also depends on consumers' gender, I provide indications of where consumers needs diverge. Thus, it expands upon the proposition of Salvador et al. (2009), who stated heterogeneity of consumers' needs to be a relevant pre-condition for

the success of mass customization. However, this study is limited to a set of product types that is based on research by Walcher and Piller (2012). It does not provide a systematic investigation of the product characteristics that make mass customization attractive for consumers. This relationship could be further assessed building on my assumption that either functional parameters or aesthetic parameters drive this interest.

In addition, by identifying that two personality traits, extraversion and openness to experience, are positively associated with consumers' interest, I add a differentiated view of the attractiveness of mass customization, which depends on consumer-specific characteristics and which should be incorporated by future research on the value of mass customization for consumers. As I utilized the well-established Big Five inventory (Goldberg, 1990) that allows the classification of all individuals along five personality traits, this view is also generally applicable to all types of consumers. In particular, my findings are relevant in light of the different value drivers that I discussed in section 2.5 of this thesis. As specific types of consumers are more attracted to mass customization than others, my findings also suggest that these value drivers are not equally beneficial for all types of consumers and they also might perceive those drivers differently. Therefore I further elaborate on this assumption in section 6 of my thesis, where I investigate consumer-specific antecedents of the perceived value of mass customization.

This study has several implications for the following parts of my thesis. Individual differences appear to be highly relevant for the attractiveness of mass customization. Therefore, it is likely that the choice behavior in customization and the perceived value of a customized product also vary among individuals. In the following parts of my thesis, I elaborate on this proposition and incorporate consumer-specific variables into my studies. Drawing on my finding that extraverted consumers have an increased interest in customizing products, I expect them to be particularly apt to show their customized product to others in public. This in turn may affect the importance for them to have a unique product. Thus, in the next part of my thesis I investigate consumers' choice behavior and the role of uniqueness during customization. As consumers' interest varies among product types, I focus on the products where respondents stated to be highly interested in customization. This is important as low interest is likely to dilute consumers' view on mass customization, particularly with regards to their choice behavior. Moreover, this study implies that products should also primarily contain functional and aesthetical parameters in order to arouse interest in customization.

Based on these implications, I expect automobiles and sports goods to provide the best conditions for my subsequent studies, as customizing these product types proved to be similarly attractive to both male and female consumers.

5 Part II: Choice behavior and its determinants in mass customization

5.1 Introduction

Nowadays consumers are again increasingly striving for craftsmanship and individualization (Hessman, 2014). This desire is rooted in consumers' natural need to be somewhat different to others (Snyder and Fromkin, 1980). To serve this need for uniqueness through customized products, many industries have begun to introduce mass-customized offerings. By combining new information and communication technologies and flexible manufacturing systems, they manage to cheaply produce individualized products, at least in part designed by each customer according to his or her own preference. Mass customization (MC) thus empowers consumers to differentiate themselves from others and enjoy feelings of uniqueness (Schreier, 2006). This perceived uniqueness of their product increases consumers' valuation of it (Franke and Schreier, 2008, Merle et al., 2010).

Taking into account this effect, companies' communication strategies emphasize the uniqueness of customized products as a central benefit to customers. For example, automotive manufacturers Opel and Vauxhall write on the website of their model *"ADAM": "With over a million different design configurations on offer, you're sure to discover a combination that makes your ADAM truly unique"*[17]. Similarly, uniqueness is a key value proposition in other industries such as sportswear (e.g., Nike with *"NIKEiD"* and Adidas with *"miadidas"*), bicycles (Urbike.de), or apparel (www.apliiq.com).

At the same time, social psychology leads me to question the notion that more uniqueness is always desirable (e.g., Snyder and Fromkin, 1980, Snyder, 1992, Ruvio, 2008). Besides striving for uniqueness, people are also inclined to conform to others (Cialdini and Goldstein, 2004), resulting in a conflict between these two opposing forces (Lynn and Snyder, 2002). Conformity is either caused by normative or informational

[17] http://www.vauxhall.co.uk/vehicles/vauxhall-range/cars/adam/features/design.html, last website access: 10.03.2015 10:17

motivations (Deutsch and Gerard, 1955); the aim to behave socially correct or simplify difficult decisions (Bikhchandani, Hirshleifer, and Welch, 1998).

Recently, this literature has been applied to understanding how consumers negotiate the conflict between uniqueness and conformity in their buying decisions. Berger and Heath (2007) showed that consumers preferably use identity-signaling product domains in order to stand apart from others. Ruvio (2008) identified that consumers' behavior is driven by these two opposing needs and consumers use possessions in order to satisfy uniqueness and conformity simultaneously. Likewise, in a series of experiments, Chan, Berger, and Van Boven (2012) found that consumers pursue both uniqueness and conformity in choice settings, for example by choosing a popular brand but a distinctive color for their car. In the field of mass customization, consumers have been shown to be susceptible to feedback from peers (Franke, Keinz, and Schreier, 2008), which provides first indications that conformity is likely to be a relevant factor.

In this part of my thesis, I investigate how users of MC toolkits choose between uniqueness and conformity, and seek to understand the properties of their preferred mix. Since uniqueness has been regarded as a central value driver in MC literature and practice (Schreier, 2006, Franke and Schreier, 2008, Merle et al., 2008), it seems important to understand how the opposing need for conformity is expressed in mass customization decisions.

Following literature on consumer behavior (Berger and Heath, 2007, Ruvio, 2008, Chan et al., 2012), I proceed with the proposition that consumers negotiate these two needs at the level of individual product attributes, potentially choosing some attributes to express uniqueness and others to express conformity. I distinguish attributes conveying hedonic vs. utilitarian benefits (Holbrook and Hirschman, 1982, Batra and Ahtola, 1990, Dhar and Wertenbroch, 2000, Voss, Spangenberg, and Grohmann, 2003). While hedonic benefits arise from the sensory experience and feelings consumers derive from the purchase, utilitarian benefits result from the functions the product provides, (cf. Holbrook and Hirschman, 1982, Batra and Ahtola, 1990, Voss et al., 2003). Prior research on regulatory focus theory (Higgins, 1997, 1998, 2002) has shown that hedonic attributes are related to achieving promotion goals, i.e. striving for positive outcomes and emotions such as excitement and cheerfulness. In contrast, utilitarian attributes serve to meet prevention goals, i.e. to avoid negative outcomes, and result in emotions like security and confidence (Chernev, 2004, Chitturi, Raghunathan, and Mahajan, 2007,

Chitturi, Raghunathan, and Mahajan, 2008). I relate these findings to choices of uniqueness or conformity in MC and hypothesize that consumers seek uniqueness in hedonic product attributes, while preferring conformity for utilitarian product attributes.

In a series of experiments, I test under what conditions consumers of customized products opt for uniqueness or conformity, respectively. I asked participants to configure products (that is, cars and shorts shoes) featuring hedonic and utilitarian attributes according to their own preference. For the treatment group, I induced perceptions of uniqueness or conformity for hedonic and utilitarian attributes, respectively, by providing information on the choices of other consumers, i.e. on the popularity of the different options.

As hypothesized, I find that consumers prefer unique options for hedonic attributes but tend towards conformity for utilitarian attributes. Their choices are influenced by two personal characteristics: While consumers' product-specific need for uniqueness (but not their general need for uniqueness, unlike in prior studies) increases their tendency to select unique options, high product involvement does not weaken their choice of conformity. The latter finding runs counter to my theoretic reasoning and is discussed below.

The principal contributions of this study are as follows: I challenge and extend beyond MC research that identified product uniqueness as a key value driver of customized products. I add conformity as a driver of consumer choice and show that uniqueness and conformity are two forces pulling in opposite directions and jointly affecting choice behavior in mass customization. While the literature has regarded mass customization as a tool for consumers to fulfill their need for uniqueness, my findings highlight that this picture is incomplete. Mass customization can more accurately be seen as a tool to realize the right mix between uniqueness and conformity.

Moreover, by associating these opposing needs with the hedonic and utilitarian attributes of products, I contribute to recent research on co-creation and user-developed products. As mass customization integrates consumers into the product creation process, my findings indicate that these users pursue differentiation and look for extraordinary features in the hedonic attributes of products. Conversely, they prefer to stick to proven and reliable solutions in utilitarian attributes. These findings show that user needs and motivations to contribute to co-creation are contingent on the characteristics of the respective product.

My findings also yield important practical implications, suggesting, for example, that MC companies should provide a broad range of options in hedonic attributes in order to allow for differentiation, but can limit the choice set for utilitarian product attributes. I also suggest that focusing communication strategies exclusively on uniqueness may actually be misaligned with the goals customers really pursue in MC.

The remainder of this study is structured as follows. The next section summarizes the theoretical background and develops my hypotheses. Subsequently, I describe the methodology, measurements, and the results of three experiments in turn. Finally, I discuss the findings and highlight the contributions for theory and practice.

5.2 Theoretical background and development of hypotheses

5.2.1 Psychological background on uniqueness and conformity

People have a natural need to differentiate themselves from others. According to Snyder and Fromkin (1977, 1980), humans deliberately long for differentiation and perceived similarity can cause negative emotional reactions. This need is founded in the fact that differentiation is related to independence and autonomy, which are generally perceived as qualities of a strong character (Simonson and Nowlis, 2000). Moreover, uniqueness is an important contributor to determining one's identity, even if this need varies between individuals (Lynn and Snyder, 2002).

However, research has identified a second force which stands in direct opposition to the pursuit of uniqueness: the tendency towards conformity. Conformity is defined as *"the act of changing one's behavior to match the responses of others"* (Cialdini and Goldstein, 2004: p. 606). As Asch (1956) showed, people have a strong tendency to exhibit conforming behavior. It is a result of normative and informative motivations (Deutsch and Gerard, 1955), either to gain social approval or to utilize information for simplifying complex decisions (Bikhchandani et al., 1998, Zhu and Huberman, 2014). Thus, a conflict arises between the desire to differentiate and to conform in individuals' decision making behavior (Brewer, 1991, Simonson and Nowlis, 2000).

5.2.2 Uniqueness and conformity in mass customization

In mass customization, product uniqueness is particularly relevant. Products are often interpreted as an extension of one's self (Belk, 1988, Lynn and Harris, 1997a). Thus, they also serve to provoke feelings of uniqueness (Snyder, 1992, Lynn and Harris, 1997a). For example, products which are rare, unpopular, or very new allow their owner to feel more distinct from others. Therefore, people can satisfy their need for uniqueness (NFU) by consuming unique products (Lynn and Harris, 1997b, Tian et al., 2001, Irmak, Vallen, and Sen, 2010). Mass Customization allows for this uniqueness by providing an extensive number of options to consumers (Lynn and Snyder, 2002). Indeed, research has also demonstrated that customized products are perceived as unique and that this uniqueness provides superior value to the consumer (Schreier, 2006, Franke and Schreier, 2008, Merle et al., 2010). Franke and Schreier (2008), for example, conducted an experiment in which participants designed a cell phone cover and subsequently reported their perceived uniqueness of that product as well as their willingness-to-pay. The authors identified perceived product uniqueness to be an independent driver of participants' willingness-to-pay.

Besides uniqueness, conformity also affects the choice behavior of consumers (Ruvio, 2008). For example, when options are limited (Curtis and Desforges, 2013) or consumers have to explain their choices (Simonson and Nowlis, 2000), consumers adjust their choices to the preferences of others. Conformity can even reverse consumers' previous decisions (Zhu and Huberman, 2014). However, is this effect also present in product customization, and if so, how is it compatible with consumers' preference for uniqueness? First indications for the relevance of conformity in mass customization can be found in the literature. Franke et al. (2008) identified that consumers integrated feedback from other peers regarding the design of their customized product, which also positively affected the evaluation of their product design. Similarly, Hildebrand et al. (2013a) identified that consumers who received feedback on their car designs through social media modified them and reduced the uniqueness of their final configurations. These findings suggest that consumers strive for conformity alongside uniqueness in mass customization.

Prior research suggests that consumers' decisions are influenced by both needs, the need for uniqueness and the need for conformity, simultaneously. For example, Berger and Heath (2007) tested consumers' diverging behavior in various product

categories and identified that consumers particularly prefer to choose against the majority in identity-signaling product domains such as music artists or car models. Similarly, Ruvio (2008) identified that consumers' behavior is affected by two needs, their need for assimilation and their need for differentiation. Further support for the dual existence of the need for uniqueness versus the need for conformity is provided by Chan et al. (2012). In a series of experiments, the authors investigate how consumers navigate that tension and find that they use different product attributes to pursue either goal. In a hypothetical car purchase, participants chose a popular brand but selected a distinctive color.

5.2.3 Associating uniqueness with hedonic and conformity with utilitarian product attributes

The benefits for consumers can be categorized into utilitarian and hedonic benefits (Holbrook and Hirschman, 1982, Batra and Ahtola, 1990, Voss et al., 2003). Utilitarian benefits derive from the functions products provide and are assessed by consumers' cognitive and rational patterns of thoughts (Dhar and Wertenbroch, 2000, Addis and Holbrook, 2001). Hedonic benefits, by contrast, arise from the sensations and experiences associated with the product and satisfy affective desires of consumers (Chitturi et al., 2008, Alba and Williams, 2013). Utilitarian and hedonic benefits can be associated with individual product attributes (Dhar and Wertenbroch, 2000). In the case of a car, for instance, safety features can be regarded as utilitarian product attributes, whereas an aesthetic design is a hedonic attribute (Chitturi et al., 2008). In the following paragraphs I use utilitarian attributes to refer to attributes conveying utilitarian benefits to consumers and hedonic attributes as attributes that can be associated with hedonic benefits for consumers.

Prior research has shown that consumers pursue different goals in utilitarian and hedonic product attributes. Higgins' regulatory focus theory (1997, 1998, 2002) distinguishes two kinds of goals, which he calls promotion focus and prevention focus. Promotion focus refers to individuals' striving to maximize positive outcomes and achieve a desired state, whereas prevention focus refers to their seeking to minimize negative outcomes and avoid an undesired state. Relating regulatory focus theory to the goals consumers attached to utilitarian and hedonic product attributes, prior research indicates that consumers mostly seek to fulfill prevention-oriented goals in utilitarian

product attributes, while pursuing promotion-oriented goals in the hedonic attributes (Chernev, 2004, Chitturi et al., 2007, Chitturi et al., 2008).

Building on this research, decisions in utilitarian attributes are more cognitively driven (Dhar and Wertenbroch, 2000, Addis and Holbrook, 2001). Weighing up options against each other in these attributes can be mentally strenuous. Particularly when cognitive resources are limited, consumers utilize their dominating regulatory focus to process information and to construct their preferences (Wang and Lee, 2006). In utilitarian attributes, this focus is predominantly prevention oriented (Chitturi et al., 2008). In this case consumers rather rely on a safe and systematic information processing strategy (Florack, Friese, and Scarabis, 2010) and prefer to behave in a risk-averse manner (Higgins, 1998). This proposition is also in line with Mourali, Böckenholt, and Laroche (2007) who found consumers prefer compromise (i.e. less risky) options for products that are associated with prevention concerns. Risk averseness is expressed by a conforming choice behavior as people rely on the experiences of others (Henrich and Boyd, 1998, Henrich and Boyd, 2002). Thus, conformity provides a useful shortcut for consumers to make the right decision in a mentally effective way, minimizing the subjective risk of making the wrong decision and simultaneously saving one's own cognitive resources (Bikhchandani et al., 1998, Chartrand and Bargh, 1999, Cialdini and Goldstein, 2004). Drawing on that, I expect consumers of customizable products to conform to others in utilitarian product attributes, which leads to my hypothesis 1:

> *H_1: Consumers prefer conformity when customizing utilitarian product attributes.*

The central statement of the uniqueness theory proposes that every individual wants to be unique at least to some extent (Snyder and Fromkin, 1977, 1980). People perceive high levels of similarity as undesirable. Particularly when people are made aware of high similarity to others, they tend towards non-conformity (Fromkin, 1970). Thus, they seek for a balance between being too similar and too distinct from others (Brewer, 1991). As consumers use products as extensions of their own identity (Belk, 1988), they are expected to pursue this balance in consumption decisions as well. Mass customization gives consumers the opportunity to customize different product attributes according to their preferences. As I proposed that consumers are likely to conform to others in utilitarian product attributes, I expect them to antagonize too high levels of similarity by choosing unique options in hedonic attributes. Moreover,

consumers seek a pleasurable experience in hedonic product attributes. They try to achieve a final product configuration with the product attributes they desire. In mass customization, perceived uniqueness has been found to positively affect the perceived value of the customized product (Franke and Schreier, 2008). This finding supports my proposition that consumers at least partly desire uniqueness in customization. If consumers are able to achieve their promotion-oriented goal in hedonic attributes, promotion-related emotions such as cheerfulness and excitement are evoked (Chitturi et al., 2008). However, choosing the popular standard option in such attributes is likely to be less exciting for consumers than choosing an option that implies unfamiliarity. Consequently, consumers are expected to avoid the popular standard option in hedonic attributes in order to feel excited and satisfy their promotion goal. Based on these argumentations, consumers in mass customization are expected to prefer unique options over popular ones in hedonic product attributes:

H_2: Consumers prefer uniqueness when customizing hedonic product attributes.

5.2.4 The influence of individual need for uniqueness and product involvement

I expect product involvement to be a relevant determinant in the hypothesized choice behavior as it also significantly positively affects the perceived product value in mass customization (Franke et al., 2009). As stated above, consumers' decisions in utilitarian attributes activate cognitive patterns of thought, which can be time-consuming and costly (Bikhchandani et al., 1998). However, consumers with low involvement invest less effort in customizing their product compared to highly involved consumers (Franke et al., 2009). Thus, these consumers are particularly susceptible to pursue an effective approach that minimizes their cognitive effort. This can be realized by pursuing informative conformity and relying on the information of others (Bikhchandani et al., 1998, Cialdini and Goldstein, 2004). Moreover, as proposed above, conforming consumer behavior in utilitarian attributes is guided by prevention orientation and the goal to minimize the risk of negative outcomes (Chitturi et al., 2008). For consumers with low product involvement, the risk of making wrong decisions in customization is amplified, as they typically have less insight into their own preferences (Huffman and Kahn, 1998, Franke and Hader, 2014). People who have a low level of product involvement are particularly likely to lack clear preferences at the beginning of

the customization process and thus more easily adjust their preferences towards others. In contrast, preferences of highly involved consumers should be more robust, making them less susceptible to the choices of others. Thus, I hypothesize that the level of product involvement weakens the effect of conforming behavior in the utilitarian attributes of a product:

> *H_3: Consumers' product involvement weakens the conforming choice behavior in utilitarian product attributes.*

By contrast, I expect consumers with a high personal need for uniqueness to exhibit stronger preferences for unique options. Consumers' need for uniqueness (CNFU) is defined as *"the trait of pursuing differentness relative to others through the acquisition [...] of consumer goods"* (Tian et al., 2001: p. 52). Consumers with high values in CNFU particularly aim to avoid similarity to others and prefer unpopular choices (Tian et al., 2001). Likewise, Imhoff and Erb (2009) identified individuals with a high need for uniqueness to be more strongly motivated to show non-conforming behavior. Hence, this personality trait is expected to intensify the aforementioned preference for uniqueness in hedonic product attributes. This proposition is further supported by past findings in mass customization. Franke and Schreier (2008) showed that the desire for unique products positively moderates the effect of perceived uniqueness of a customized product on consumer's willingness-to-pay. Consumers with a strong desire for unique products who perceive their customized product as unique are also willing to pay significantly more for their customized product. This increase in willingness-to-pay indicates that it is of utmost importance for consumers with a high need for uniqueness to perceive their final customized product as unique. Moreover, consumers' need for uniqueness can be fulfilled by being innovative and adopting new products faster than others (Burns and Krampf, 1992, Lynn and Harris, 1997a). Options that are chosen by only few other consumers are likely to better transmit this innovativeness and newness than very popular options and should contribute to satisfy this need. Thus, the preference for unique options is likely to be reinforced for these consumer types. Drawing on these argumentations I derive the following hypothesis:

> *H_4: Consumers' need for uniqueness intensifies the differentiating choice behavior in hedonic product attributes.*

Figure 11 summarizes the research model. I test this research model in three studies. Study 1 serves as pre-test whether consumers prefer unique and popular options in one and the same customization activity. Study 2 investigates hypotheses H_1 and H_2 by testing choice behavior in the utilitarian and hedonic product attributes. Finally, study 3 replicates the findings from study 2 for a different product domain and using a laboratory experiment, and extends the analysis to include moderators as hypothesized in H_3 and H_4.

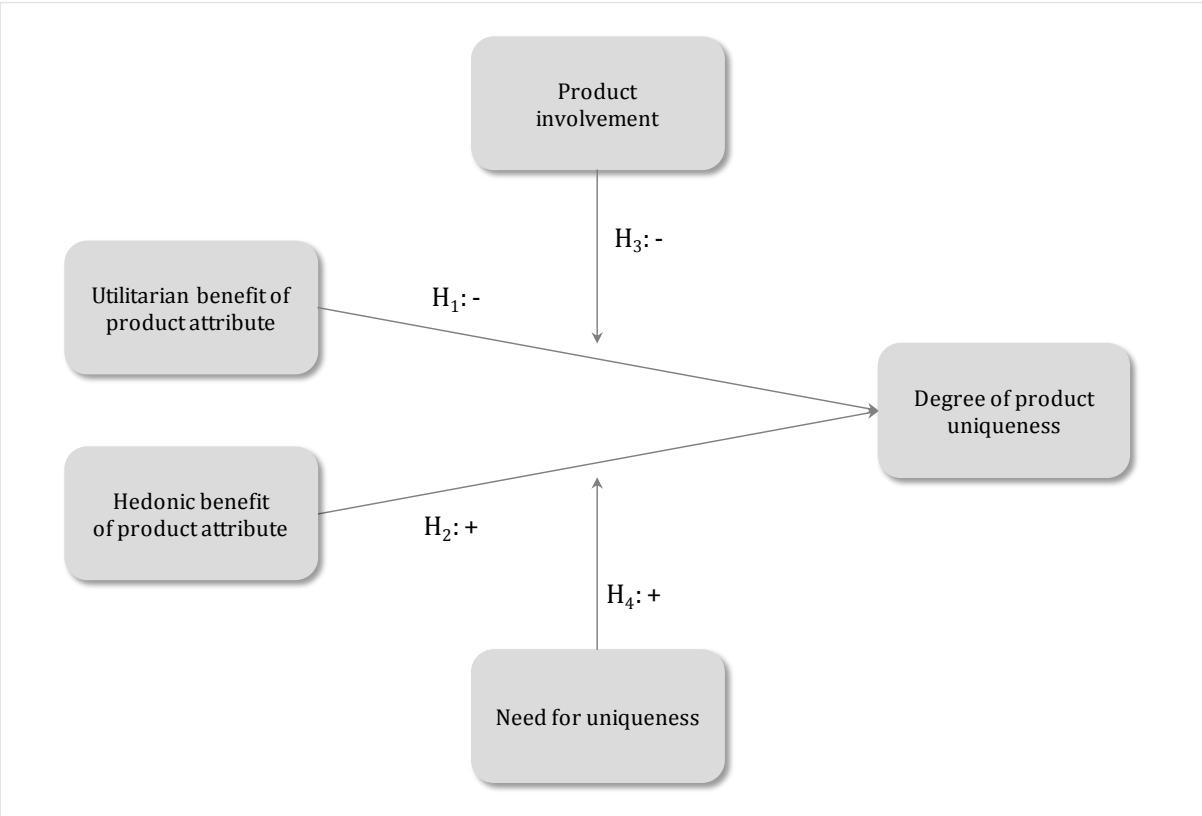


Figure 11: Research model

5.2.5 Testing the effect of consumers' choices on the preference fit

As stated in section 2.5.2, mass customization provides an increased preference fit due to the possibility for consumers to choose more precisely what they like (Randall et al., 2007, Franke et al., 2009). However, the hypothesized difference in choice behavior might affect consumers' perceived preference fit because consumers no longer customize their product according to what they (objectively) like but what others have or have not chosen. This might lead to a conflict for consumers: they might actually like a

specific option (e.g., a color) but at the same time prefer to have a unique customized product. Selecting a unique option that differs from the initially preferred one might reduce the perceived fit of the customized product. Consequently, two central questions arise that need to be considered in the context of choice behavior in mass customization:

1. Do consumers perceive a lower fit (utilitarian value) of their customized product when they choose differently due to the pursuit of uniqueness and conformity?
2. How do consumers manage a potential conflict between preference fit and their need for uniqueness and conformity? Do consumers accept a loss in preference fit in order to be unique or to conform to others?

On the one hand, it seems plausible that the perceived preference fit decreases through this change in choices, because consumers no longer select what they like but what others have (or have not) selected. On the other hand, past research identified that consumers in mass customization learn about their own preferences during customization (Franke and Hader, 2014). If this holds true, the conflict between these two forces is likely to be resolved as consumers should then construct their own preferences based on the information provided to them. To shed light on this potential conflict between the perceived preference fit and consumers' needs for conformity and uniqueness, I conduct a fourth study that investigates the questions raised above.

5.3 Development of a MC-specific experiment tool

To test the proposed research model in experiments, a separate tool was developed by two informatics students in the course of an interdisciplinary project that I supervised over a period of six months and that was installed on a web server of the Technische Universität München[18]. The objective of this project was to develop a highly flexible tool that allows defining different experiment setups, groups and products. Moreover, it includes a product configurator that instantly visualizes the customized product for the participants in order to create a realistic customization environment. For the visualization of the products I was allowed to utilize picture material and

[18] I am highly indebted to the excellent work and support of Paviel Zakiervasevic and Milyausha Saleeva who developed the configurator within the course of their interdisciplinary project under my supervision at the chair of Technology Management (Prof. Raasch), Technische Universität München, TUM School of Management.

descriptions from commercial configurators of sports shoes and automobiles[19]. As this tool is a central component of the empirical studies that I conducted, I provide a short overview of it.

5.3.1 Basic structure of the tool

The tool consists of two main layers, the front-end and the back-end, which interact with each other (Figure 12).

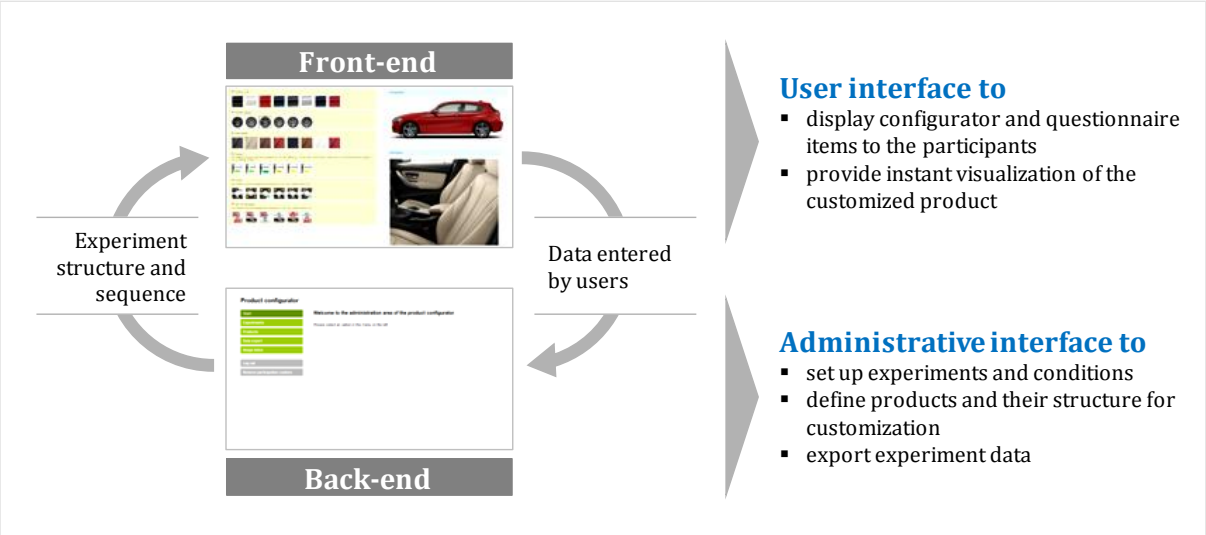


Figure 12: Basic structure of the experiment tool

The front-end provides the interface for participants and guides them through the experimental steps that have been set up in the back-end of the tool. Thus, the key function of the front-end is to collect data from the participants regarding questionnaire items and the product customization. All data entered in each step (e.g., choices in the configurator or responses to questionnaire items) are transmitted to the back-end and stored in an SQL database. The tool also logs data about the customization process itself (e.g., how long participants need for customizing their product and how often they switch their choices).

In addition to this, the front-end visualizes the core part of the tool – the product configurator. The product configurator consists of a choice menu on the left side and one

[19] I would also like to gratefully acknowledge the support from the BMW AG and Nike Inc., who gave me permission to utilize pictures and descriptions from their commercial websites for the configurator (http://www.bmw.de; last website access: 23.02.2015, 15:27; http://www.nike.com/de/de_de/c/nikeid; last website access: 05.03.2015, 13:11).

or more product pictures on the right side (Figure 13). Every change participants apply to their customized product is instantly visualized in the product picture(s). This instant visual feedback is important to enable a realistic customization experience.

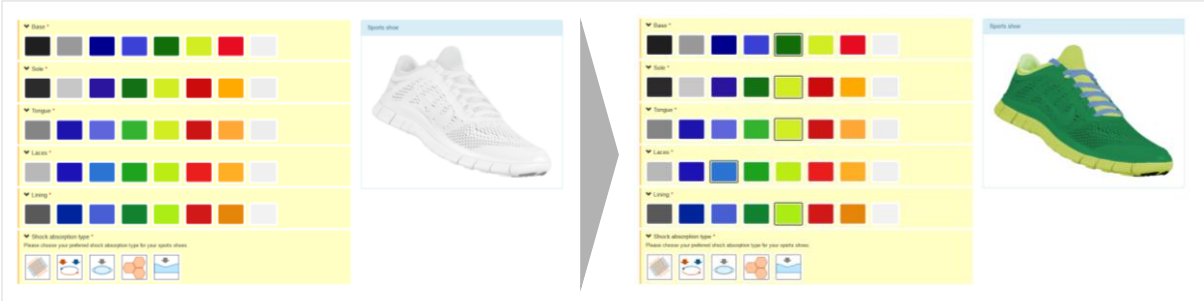


Figure 13: Instant visual feedback in the product configurator

The back-end part of the tool grants access to the administrative interface and provides three central functions to the administrator:

- Setting up experiments
- Defining products and their attributes for customization
- Exporting experiment data (questionnaire data, user configurations)

5.3.2 Key functionalities of the tool

Setting up experiments

All experiments in the tool have a modular structure. For each experiment, a varying number of experimental groups can be defined. In turn, each group runs through a pre-determined number of steps which represents the sequence of the experiment. The sequence can either be kept equal for all groups or can be individually adjusted for each experimental group. This allows the definition of a treatment for one group which is not applied in the other experimental group(s). Figure 14 gives an example of an experiment with a modular structure that consists of two groups and a sequence with five steps in total (one is skipped in each group). The treatment in this case is implemented in the configurator itself, leading to two different versions (configurator A and B) for the two groups.

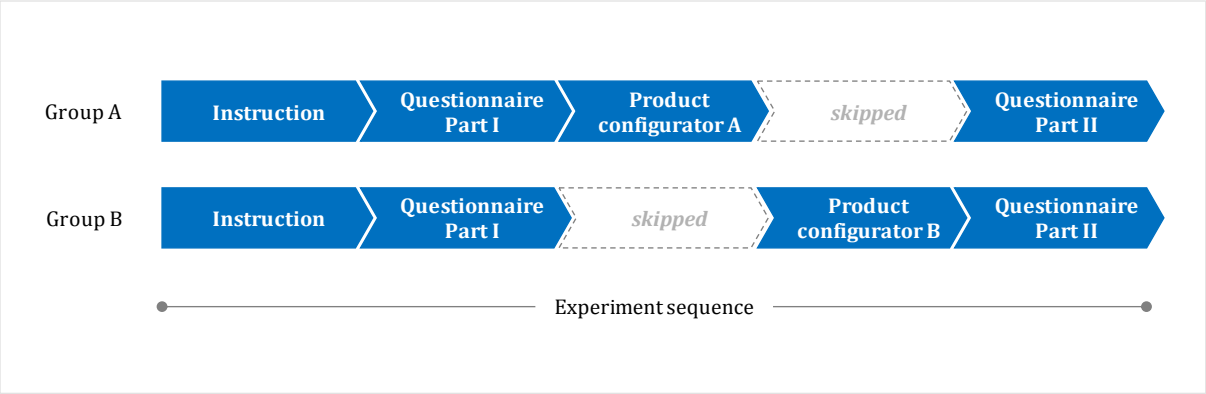


Figure 14: Exemplary structure of an experiment in the tool

Each step can contain different elements such as instructions, questionnaire items (e.g., text fields, Likert scales, and radio button matrices), or a product configurator, which enables participants to customize a product. For the questionnaire items, a separate syntax was developed that allows for a high degree of flexibility: different question types can be combined in a single step in order to match the requirements of the experiment. As the tool saves the user data after each step, it is also possible to re-use data entered by participants in the same experiment. For example, this function allows showing participants their customized product variant again in order to ask them whether they would like to modify their design. Figure 15 illustrates the administrator interface for the definition of the experiment structure.

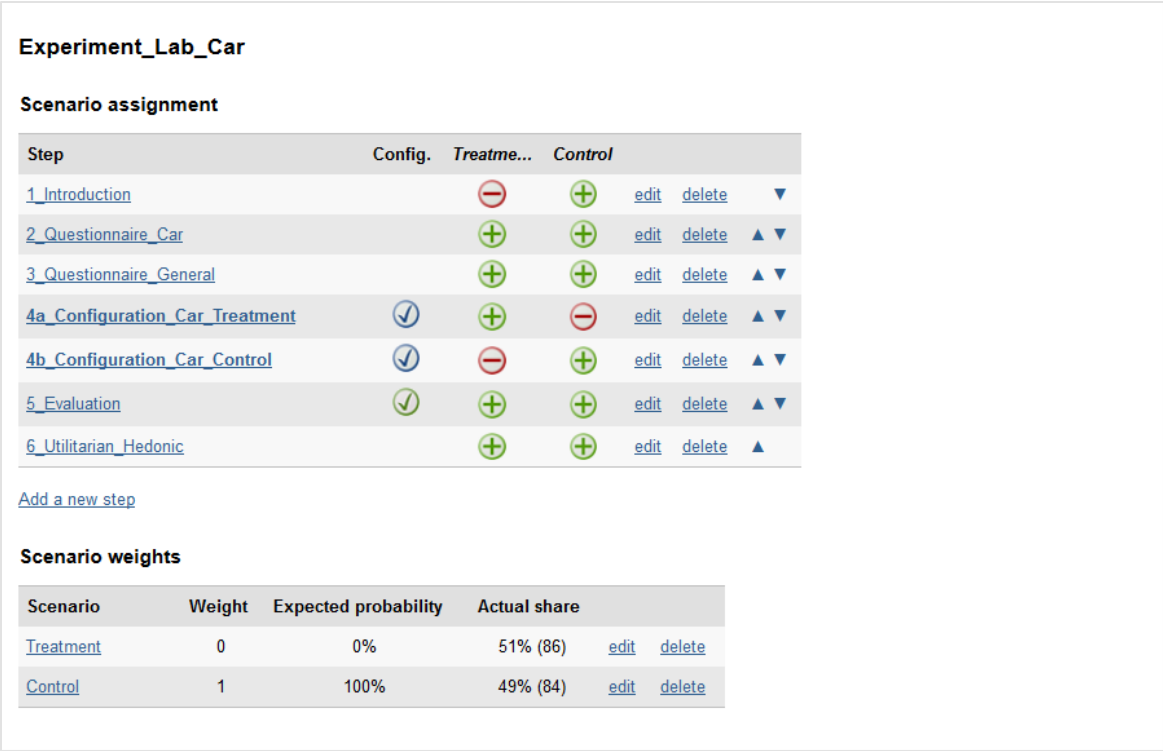
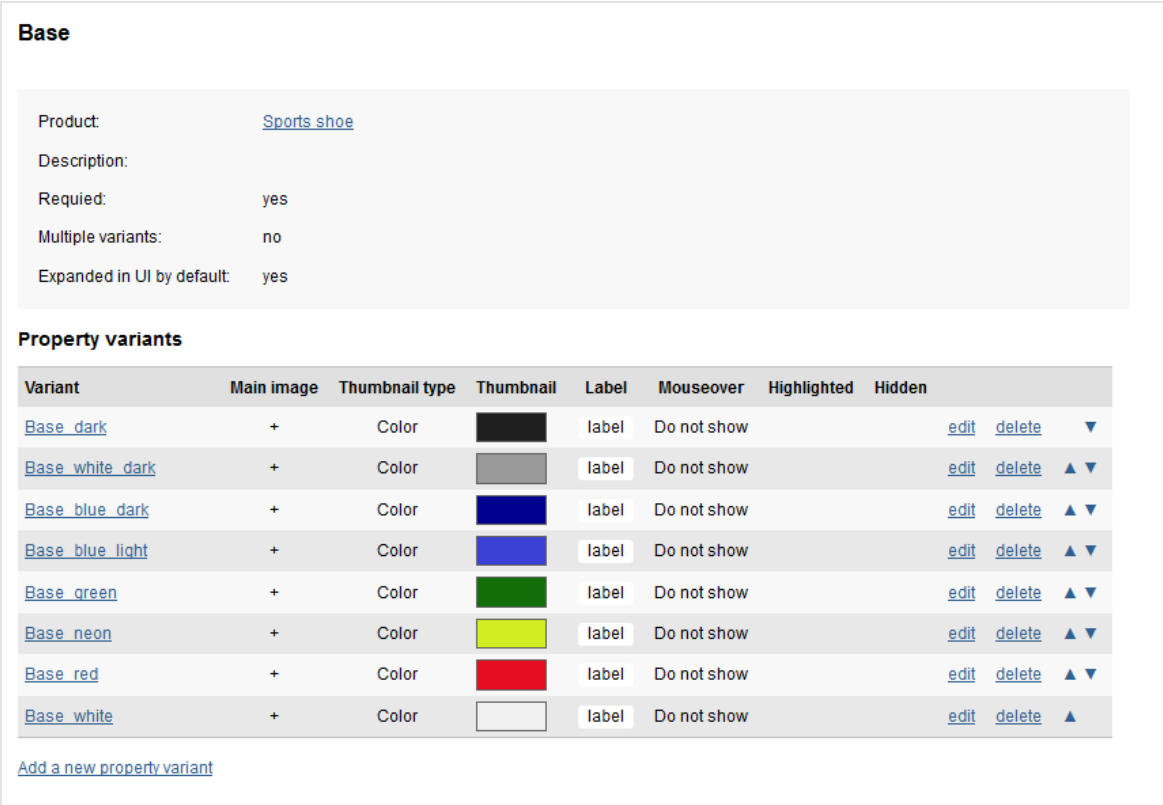


Figure 15: Administrator interface for the setup of experiments

As random assignment of participants to one of the experimental groups is important to eliminate any potential systematic errors (Jackson and Cox, 2013), the tool also provides the possibility to define probabilities for each group. Consequently, at the start of each experiment participants are randomly assigned to one of the experimental groups according to the pre-defined probability.

Defining products and attributes for customization

In the back-end of the tool different products can be defined, which can then be integrated into the sequence of an experiment by a specific syntax command. For each product, a hierarchical structure with a flexible number of attributes and options per attribute can be created (Figure 16). If required, descriptions for each option can be assigned to appear in the experiment when participants move the mouse over the respective option.



Base

Product:	Sports shoe
Description:	
Requied:	yes
Multiple variants:	no
Expanded in UI by default:	yes

Property variants

Variant	Main image	Thumbnail type	Thumbnail	Label	Mouseover	Highlighted	Hidden			
Base_dark	+	Color		label	Do not show			edit	delete	▼
Base_white_dark	+	Color		label	Do not show			edit	delete	▲ ▼
Base_blue_dark	+	Color		label	Do not show			edit	delete	▲ ▼
Base_blue_light	+	Color		label	Do not show			edit	delete	▲ ▼
Base_green	+	Color		label	Do not show			edit	delete	▲ ▼
Base_neon	+	Color		label	Do not show			edit	delete	▲ ▼
Base_red	+	Color		label	Do not show			edit	delete	▲ ▼
Base_white	+	Color		label	Do not show			edit	delete	▲

Add a new property variant

Figure 16: Administrator interface for the definition of customizable products

To ensure proper visualization of the customized product in the actual experiment (front-end), an image can be assigned to each option. The tool then combines the images of the different attributes to one holistic product picture, yet this requires a thorough preparation of the images used by defining transparent zones. Figure 17 highlights this described functionality.

Figure 17: Modular composition of a product image in the tool

The tool provides some additional functions that had to be integrated due to specific requirements of the series of experiments of this part. For example, it is possible to define a specific label for each option, which can be hidden or unhidden between different experiment steps. This allows giving participants of one group additional information during customization while hiding this information for the other groups. Besides that, the configurator can highlight participant's previous configuration by placing colored frames around the options that a participant selected before. This function is required for study 4, where I ask participants whether they would like to modify their original design.

5.4 Study 1: Establishing conformity as driver of choice behavior in MC

In study 1, I test the general proposition that the desire for conformity, as well as uniqueness, drives consumers' choice behavior in MC. I investigate this in an online experiment-cum-questionnaire in which test subjects were asked to configure a car. Cars have been utilized frequently by past research on mass customization (e.g., see Syam, Krishnamurthy, and Hess, 2008, Brabazon, MacCarthy, Woodcock, and Hawkins, 2010, Hildebrand et al., 2014). Participants were recruited from a large and diverse pool

via Amazon Mechanical Turk (MTurk; similarly, Horton, Rand, and Zeckhauser, 2011, Rand, 2012). MTurk has been shown to generate reliable data on decision making behavior that is comparable with traditional samples (Goodman, Cryder, and Cheema, 2013).

5.4.1 Method

I used a between-subjects experimental design comprising a treatment and a control group. The two sessions were scheduled in quick succession; participants from the control group were not allowed to participate in the treatment group. During the customization activity, the participants of the treatment group received information on the choices of the control group; the control group customized the product without any such information. To run the experiment, I adapted an online configurator by the company HYVE[20].

The sample consisted of 150 participants, each of whom received a compensation of 2 USD. I excluded the participants whose response time was in the lowest decile since such response times would not allow for thoroughly reading and understanding the questionnaire. Consequently, there were 65 participants in the control group and 71 participants in the treatment group (average age: 36.2 years; 51.5% females). The average time participants spent on the task was 13.8 minutes (SD=4.7). The majority of participants (85.3%) came from the United States.

The experiment included three sequential steps which were kept identical for both groups according to experimental standards (Jackson and Cox, 2013): All subjects started by reading the general instructions. In the second part the participants used the online configurator to customize a car. The configurator comprised eight attributes (engine, exterior color, interior color, wheel design, safety extras, usability extras, entertainment extras, and service packages), each of them with six different options. The attributes were selected based on the online configurators of major car brands. Participants had to choose one option for each attribute, resulting in a total of over 1.6 million possible configurations. The configuration tool also provided a visualization of all the options by showing small images and short descriptions of each option. For realism, and with the consent of the manufacturer, I used picture material and

[20] I am indebted to the great support from Prof. Johann Füller and Dorothée Stadler from HYVE (https://www.hyve.net/; last website access: 25.03.2015, 15:53) as they gave their consent to me to utilize their web-based survey tool for the pre-test (study 1).

descriptions from the BMW car configurator (www.bmw.de). Finally, participants answered questions on the control variables that I included in the study such as gender, age, and educational degree.

Control group

The purpose of the control group was to obtain information about consumers' preferences when customizing a car. This data is used as the basis for the manipulation in the treatment group. Thus, the control session had to be completed before the treatment session took place. However, I ran both sessions very shortly after each other to keep experimental conditions (e.g., similar available online pool of participants) and restricted access to this second session for all participants who took part in the control session to prevent participants from taking part twice. Besides that, I test for any differences in the control variables between both sessions.

Treatment group

Participants in the treatment group received information on the choice distribution of the control group. A label attached to each option indicated how often this option had been chosen by unspecified others previously. Complementary to the labels, the configurator provided a description of the labels (see Table 8) as well as an example of the meaning. For each attribute, the six options were equally distributed among the three labels, resulting in two options per label (Figure 18).

Table 8: Labels and descriptions used in the treatment group (study 1)

Label	Description
MANY (30-60%)	Many of the people (30-60%) asked before, have selected this option.
FEW (10-15%)	Only few people (10-15%) asked before, have selected this option.
NO ONE (0-5%)	(Almost) none of the people (0-5%) asked before, have selected this option.

As mentioned above, I used the choices from the control group as the basis for the treatment group. Thus, the two most frequently chosen options in each attribute received the label *"many"*, the two least frequently chosen ones were assigned the label *"no one"*, and the remaining two options were labeled as *"few"*. In four of the eight attributes (engine, safety extras, usability extras, and service package) I reversed this assignment. The reasoning was to exchange the popular attributes with the unpopular

ones in order to minimize the risk of a dominating influence of preference fit on participants' choices.

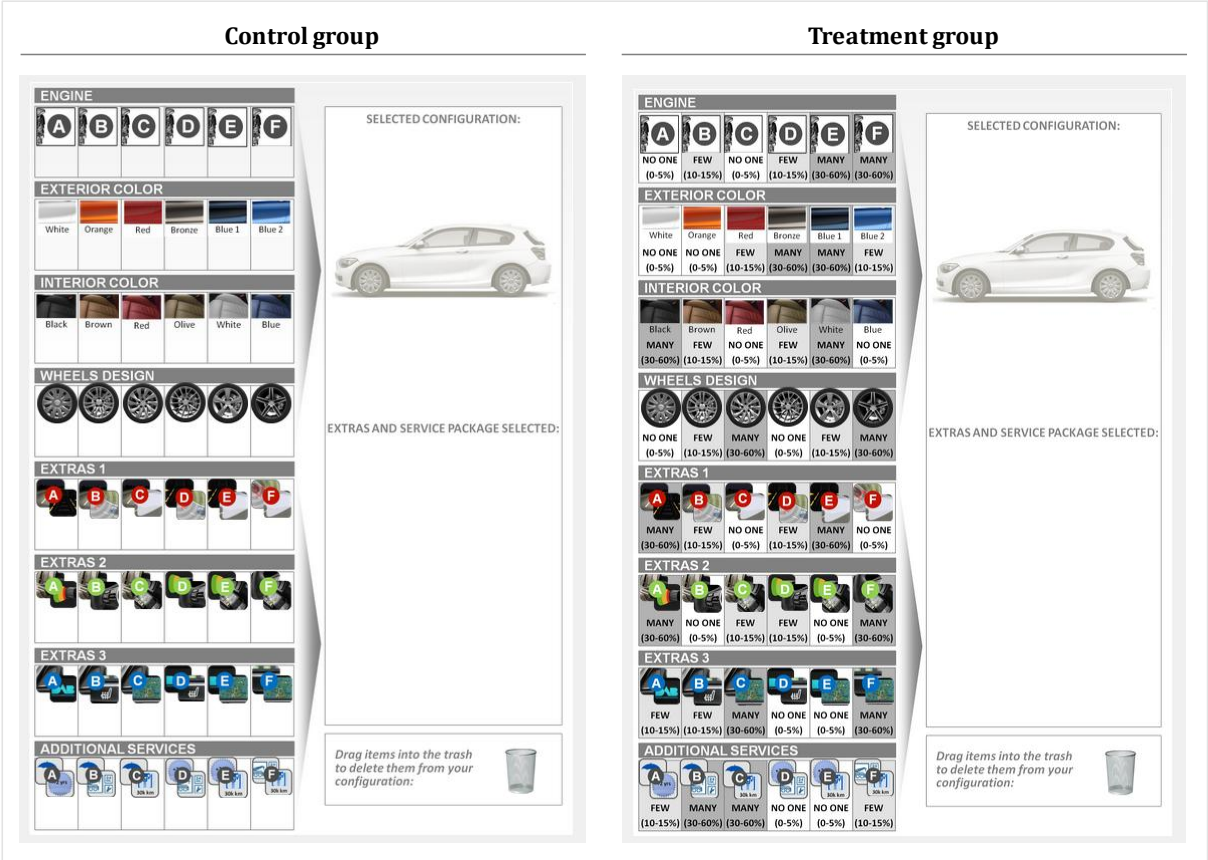


Figure 18: Configurator interface for control and treatment group (study 1)

5.4.2 Measurement

Choice behavior. I assessed participants' choice behavior by comparing the choices of the control to those of the treatment group for each of the eight product attributes. If the treatment group had a greater tendency to select options labeled *"many"*, this indicated conforming choice behavior. Conversely, a higher share of chosen options labeled *"few"* or *"no one"* implies a moderate or high proclivity towards differentiating choice behavior.

Control variables. I measured gender, age and educational degree of the participants in order to control for any differences between the groups. Educational degree was measured from 1 = *"less than high school"* to 5 = *"PhD"*.

5.4.3 Results

First, I test for differences in controls by comparing age, gender, and educational degree of both experimental groups. Table 9 provides an overview of the results. None of the control variables significantly differ between the groups. Thus, the groups can be assumed to be sufficiently similar to each other in terms of the control variables.

Table 9: Test for differences between the control and treatment groups (study 1)

	Control group (n = 65)		Treatment group (n = 71)		
	Mean	**SD**	**Mean**	**SD**	**T-value (2-tailed)**
Age (years)	36.31	10.34	36.11	11.18	0.105 (n.s.)
Share of females	50.8%	-	52.1%	-	0.155 (n.s.)
Educational degree	2.75	0.75	2.70	0.66	0.409 (n.s.)

Second, I test whether consumers pursue uniqueness and conformity in product customization. Results show preferences for uniqueness as well as for conformity depending on the product attribute (Table 10). For the engine, for example, 66.2% of the members of the treatment group chose one of the two options labeled as most popular, while these two options were chosen by only 12.3% of the control group. Similarly, information provision about popularity induced a substantial shift in choices towards popular options for safety extras, usability extras, entertainment extras, and service packages. By contrast, in the case of exterior color the preference for the two most popular options was 56.9% in the control group, but only 38.0% in the treatment group.

Finally, I apply chi-square tests on the 2x2 matrix (control vs. treatment, conforming vs. differentiating behavior) for each attribute. In six out of eight customizable car attributes chi-square tests indicate a significant difference in choices between treatment and control group (engine: $\chi^2 = 40.914$; $p < .001$; exterior color: $\chi^2 = 4.863$; $p < .05$; safety extras: $\chi^2 = 12.699$; $p < .001$; usability extras: $\chi^2 = 6.653$; $p < .01$; entertainment extras: $\chi^2 = 4.012$; $p < .05$; service package: $\chi^2 = 11.843$; $p < .001$). Only in two out of eight attributes the effect is insignificant (interior color: $\chi^2 = 0.023$; n.s.; wheel design: $\chi^2 = 1.377$; n.s.).

Table 10: Choice distribution (%) in the control and treatment groups (study 1)

	Control group (n = 65)			Treatment group (n = 71)		
Attribute	**conforming**	**moderately differen-tiating**	**highly differen-tiating**	**conforming**	**moderately differen-tiating**	**highly differen-tiating**
Engine	12.3%	36.9%	50.8%	66.2%	19.7%	14.1%
Exterior color	56.9%	24.6%	18.5%	38.0%	32.4%	29.6%
Interior color	69.2%	21.5%	9.2%	70.4%	15.5%	14.1%
Wheel design	52.3%	21.5%	26.2%	42.3%	38.0%	19.7%
Safety extras	26.2%	32.3%	41.5%	56.3%	26.8%	16.9%
Usability extras	21.5%	32.3%	46.2%	42.3%	29.6%	28.2%
Entertainment extras	49.2%	29.2%	21.5%	66.2%	16.9%	16.9%
Service package	24.6%	35.4%	40.0%	53.5%	29.6%	16.9%

To summarize, for five out of eight product attributes participants' choices significantly shifted towards popular options when popularity information was provided. For one attribute the converse was true; and two product attributes showed no significant change.

5.4.4 Discussion

Study 1 indicates that consumers seek both uniqueness and conformity in product customization. In six out of eight attributes of a customizable car, participants in the treatment group showed a significantly different choice behavior compared to the control group. In five attributes (engine, extras I-III, and service package) participants' choices considerably shifted towards popular options while in one attribute (exterior color) choice behavior pointed in the opposite direction, towards unique options. These results indicate that both forces, uniqueness and conformity, influence consumers' choice behavior in customization.

This finding is interesting as the observed conformity contradicts the main objective of mass customization – satisfying the heterogeneous needs of every individual consumer to a greater extent than standard products allow (Franke and von Hippel, 2003). Under certain conditions consumers' needs seem to converge. However, it needs to be tested if these findings can be replicated in another product category. Moreover, the underlying factors that drive consumers' choice behavior towards uniqueness or

conformity remain unclear so far. For this purpose, I need to look for commonalities of the five attributes where consumers' choices shifted towards conformity and for properties that distinguish these attributes from the exterior color of a car for example.

The investigated attributes may be separated by the type of benefits consumers obtain from them. Marketing literature differentiates between two types of benefits for consumers (Batra and Ahtola, 1990). While hedonic benefits refer to the affective sensations consumers receive from a product such as fun or excitement, utilitarian benefits mainly evolve out of functional attributes and can be considered to be helpful or practical (Voss et al., 2003). It appears that all five attributes where consumers conformed to the choices of others provide predominantly utilitarian benefits due to their functionalities. For example, it is likely that safety extras, where I observed a strong preference for popular options, might include little sensory experience such as fun or excitement but rather exhibit practical benefits to consumers such as reducing the risk of an accident. In contrast, the exterior color might only contain some degree of functionality but a higher hedonic benefit for many consumers. Past research found that these two dimensions of benefits are interlinked with the regulatory focus of consumers (Chernev, 2004, Chitturi et al., 2008). As I proposed that uniqueness represents a promotion-oriented goal and conformity is a goal under prevention orientation, the differentiation between hedonic and utilitarian benefits of a product attribute might serve as appropriate explanations for the observed choice behavior. Thus, in the next study (study 2), I draw on these hypothesized relationships between hedonic benefits and preference for uniqueness versus utilitarian benefits and consumers' preference for conformity.

5.5 Study 2: Associating differences in choice behavior with hedonic and utilitarian attributes

In study 2 I investigate whether and how choice of unique vs. popular product attributes tends to differ across hedonic and utilitarian product attributes. From hypotheses 1 and 2 (see section 5.2.3), I expect consumers to conform to others in the utilitarian product attributes and to differentiate themselves from others in the hedonic attributes. I test these hypotheses in the domain of sports shoes, which promotes comparability to other studies using the same domain (Merle et al., 2010, Franke and Hader, 2014).

5.5.1 Method

Study 2 is again based on an online experiment which I conducted via MTurk. The experimental setup is identical to study 1 (two groups, participants of the treatment condition receiving information on the popularity of options). On average, the participants spent 9.4 minutes on the task (SD=3.0). For the same reason as in study 1 I excluded participants whose response time was in the lowest 10th percentile of response time (time required < 5.8 minutes), resulting in 111 valid responses (55 in the control and 56 in the treatment group) for this study (average age: 33.5 years; 43.2% females; 83.8% from the US). On average, the participants spent 9.9 minutes on the task (SD = 3.2). Again, each participant was compensated with a payment of 2 US Dollars.

As mentioned before, I utilized the self-developed configurator with advanced visualization functionalities for this study (Figure 19). Whenever participants moved the mouse over an option or applied changes to the configuration, the product pictures on the right part of the toolkit were updated accordingly. Subjects customized two principal attributes of their sports shoes: the design (represented by choices of the colors of the base, sole, tongue, laces, and the lining) and the type of shock absorption. I assumed that shoe design induces the hedonic attribute of the product, due to its aesthetic focus (Dhar and Wertenbroch, 2000, Chitturi et al., 2007). The type of shock absorption is meant to represent the utilitarian attribute in this experiment as it determines the functionality of the product (Voss et al., 2003).

I took particular care to minimize potential effects of choice uncertainty (Huffman and Kahn, 1998, Dellaert and Stremersch, 2005). To do so, I kept the the number of options small and provided additional explanations for all attributes that were not self-explanatory, particularly detailing the advantages and disadvantages of the different types of shock absorption. (E.g.: "Stable air pillow: air pillow filled with inert gas that is squeezed on pressure - strong shock absorption, high durability, high flexibility").

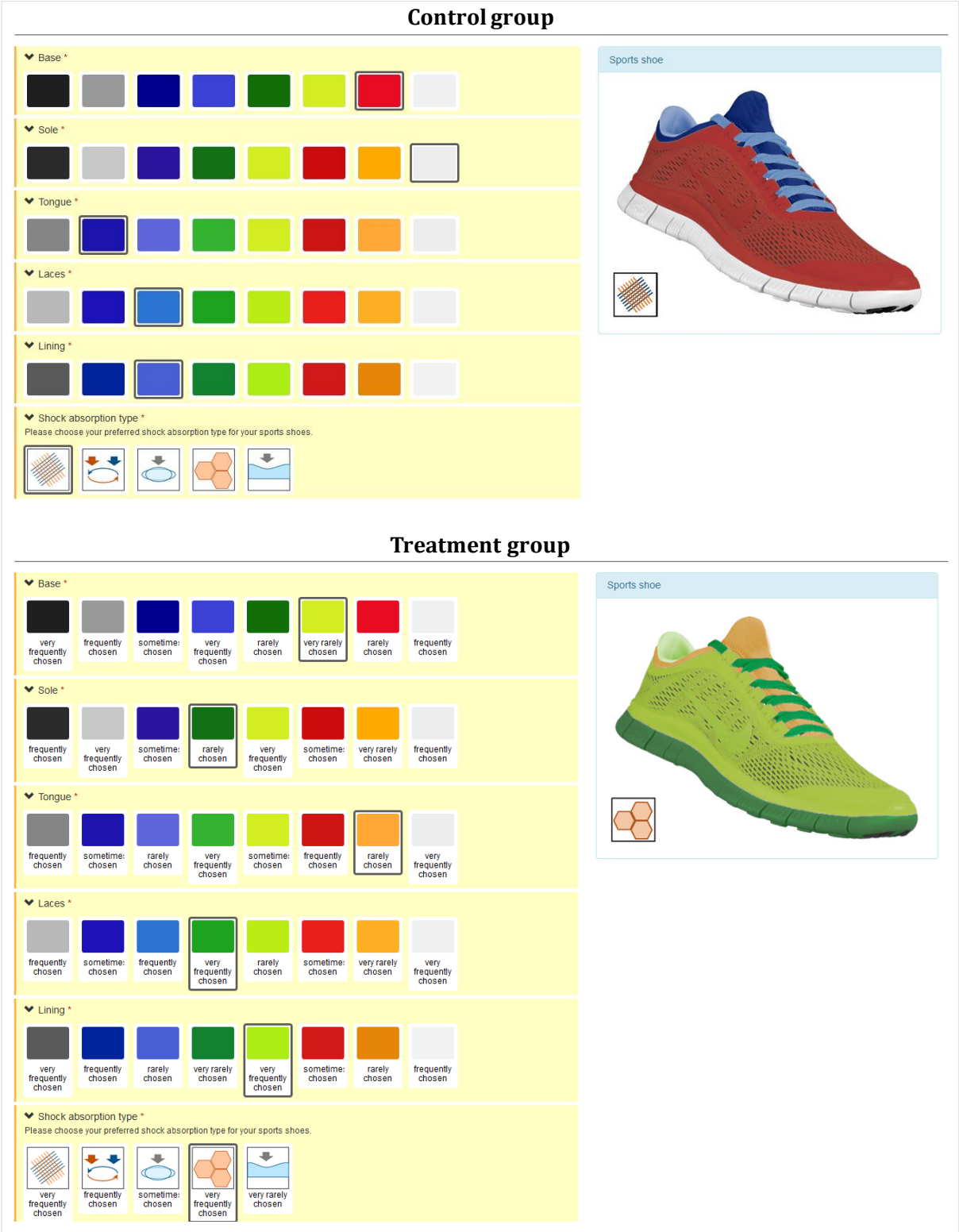


Figure 19: User interface of the sports shoes configurator (study 2)

5.5.2 Measurement

Degree of uniqueness. For greater precision, I used five labels that indicate the level of uniqueness/conformity of each choice: *"very frequently chosen"*, *"frequently chosen"*, *"sometimes chosen"*, *"rarely chosen"*, and *"very rarely chosen"*. Thus, the dependent variable – referred to as the degree of uniqueness – ranged from 1 (*"very frequently chosen"*, i.e. low degree of uniqueness) to 5 (*"very rarely chosen*", i.e. high degree of uniqueness). This variable indicates to what extent the configurations in the experimental groups are unique according to my manipulation. A higher degree of uniqueness in the treatment group than in the control group therefore indicates a proclivity towards uniqueness whereas a lower degree of uniqueness highlights a preference for conformity in the respective attribute.

Utilitarian and hedonic benefits. To measure the utilitarian and hedonic benefits of the shoe design and the shock absorption type, respectively, I used a shortened version of the measurement that has been developed by Voss et al. (2003). For each of the two attributes I applied eight semantic pairs, with four of them assessing the utilitarian benefits of the attribute and the other four testing the hedonic benefits of the attribute.

Control variables. In addition to gender, age and educational degree (from 1 = *"less than high school"* to 5 = *"PhD"*), I measured participants' general need for uniqueness by using a short 6-item version of the consumer's need for uniqueness scale (Tian et al., 2001, Franke and Hader, 2014). Besides that, I measured choice overload by including the overload confusion scale from Walsh, Hennig-Thurau, and Mitchell (2007). Except for gender, age, and educational degree, all variables were measured on 7-point Likert scales.

Table 11 provides an overview of the items and scales used in this experiment. Reliability of the scales is assessed by calculating Cronbach's coefficient alpha (Cronbach, 1951, Cortina, 1993), which measures the average correlation between all items of a variable and ranges from 0 to 1. The higher the alpha value is the more reliable the variable is. Alpha values above 0.7 indicate an acceptable degree of reliability (Peterson, 1994).

Table 11: Operationalization of variables (study 2)

Variable	Source	Items	Cronbach's α
Utilitarian benefits of attributes	Voss, Spangenberg and Grohmann, 2003	Semantic differential pairs: 1. Helpful/unhelpful 2. Functional/not functional 3. Practical/impractical 4. Necessary/unnecessary	0.92[a] / 0.84[b]
Hedonic benefits of attributes	Voss, Spangenberg and Grohmann, 2003	Semantic differential pairs: 1. Fun/not fun 2. Enjoyable/unenjoyable 3. Thrilling/not thrilling 4. Delightful/not delightful	0.92[a] / 0.90[b]
Consumer's need for uniqueness (CNFU)	Franke and Hader, 2013; Tian, Bearden and Hunter, 2001	1. When a product I own becomes popular among the general population, I use it less often. 2. I often try to avoid products or brands when I know that the average population buys them. 3. When I buy a product, it is important for me to find something that communicates my uniqueness. 4. When products or brands I like become very popular, I lose interest in them. 5. I often try to get a more interesting version of a standard product because I want to be inventive. 6. I have bought unusual products or brands to create an unusual personal image.	0.92
Choice overload	Walsh, Hennig-Thurau and Mitchell, 2007	1. It was difficult to decide which options to choose. 2. I did not know exactly which options would meet my needs best. 3. There were so many options to choose from that I sometimes felt confused.	0.72

[a] Result for attribute "shock absorption" [b] Result for attribute "shoe design"

5.5.3 Results

Like in study 1, I begin by testing for differences in the control variables between both experimental groups. My set of control variables includes choice overload (α = 0.72), consumers' need for uniqueness (α = 0.92), as well as gender, age, and educational degree. As no significant differences in means between the control and the treatment groups can be identified (Table 12), both experimental groups are assumed to have sufficiently similar characteristics in terms of these variables.

Table 12: Test for differences between the control and treatment groups (study 2)

	Control group (n = 55)		Treatment group (n = 56)		
	Mean	**SD**	**Mean**	**SD**	**T-value (2-tailed)**
Age (years)	33.18	9.16	33.73	11.77	0.275 (n.s.)
Share of females	34.5%	-	51.8%	-	1.845 (n.s.)
Educational degree	3.82	0.72	3.79	0.73	0.235 (n.s.)
Need for uniqueness	3.55	1.63	3.66	1.42	0.397 (n.s.)
Choice overload	2.98	1.46	3.08	1.32	0.361 (n.s.)

Next I test whether participants perceived the hedonic and utilitarian benefits of the product attributes shoe design and absorption type as expected, which turns out to be the case. Subjects perceive the attribute *"shock absorption type"* as primarily utilitarian ($M_{Utilitarian} = 6.37$; $\alpha_{Utilitarian} = 0.92$; $M_{Hedonic} = 4.81$; $\alpha_{Hedonic} = 0.92$). By contrast, they perceive the attribute "shoe design" as primarily hedonic ($M_{Utilitarian} = 5.25$; $\alpha_{Utilitarian} = 0.84$; $M_{Hedonic} = 5.64$; $\alpha_{Hedonic} = 0.90$). As responses are not normally distributed, I conduct a Wilcoxon signed ranks test to determine whether the observed differences are significant. The test confirms that the difference in means is significant in both product attributes (absorption type: $Z = 7.781$; $p < .001$; shoe design: $Z = 3.139$; $p < .01$).

From hypotheses 1 and 2, I expect subjects to prefer conformity in the utilitarian attribute (shock absorption type) and uniqueness in the hedonic attribute (shoe design). Again, I compare the number of choices between the two experimental groups. For the utilitarian attribute, the percentage of participants in the treatment group that chose an option labeled *"rarely chosen"* or *"very rarely chosen"* is 23.2% compared to 58.2% in the control group. By contrast, only 57.1% of the subjects in the treatment group selected an option labeled *"frequently chosen"* or *"very frequently chosen"* compared to 21.8% in the control group. Consequently, the degree of uniqueness of the configurations in the treatment group is lower than in the control group ($M_C = 3.69$ vs. $M_T = 2.36$). As this variable is ordinally scaled, I perform a Mann-Whitney-U-test to assess the significance of the difference in means. The test result indicates that this difference between the experimental groups is significant ($Z = 4.486$; $p < .001$).

For the hedonic attribute (shoe design), I find the opposite effect. Here, options marked as *"rarely chosen"* or *"very rarely chosen"* were chosen by 13.1% in the control group but by 20.7% in the treatment group. Options marked as *"frequently chosen"* or

"very frequently chosen" were selected by 66.2% in the control group, and by 58.2% in the treatment group. Results from a Mann-Whitney-U-test show that the degree of uniqueness is significantly higher in the treatment group compared to the control group ($M_C = 2.20$; $M_T = 2.45$; $Z = 2.253$; $p < .05$).

Finally, I conduct an analysis of covariance (ANCOVA) for the hedonic and the utilitarian product attribute (Table 13). I use the degree of uniqueness as the dependent variable and integrate the other variables included in the study as covariates. I find a significant main effect of the experimental condition on the dependent variable for both the hedonic ($F = 4.060$; $p < .05$) and the utilitarian attribute ($F = 22.925$; $p < .001$), which further supports hypotheses 1 and 2. However, none of the other variables (age, gender, educational degree, choice overload, and need for uniqueness) has a significant effect on the degree of uniqueness for the hedonic or the utilitarian product attribute. In other words, the desire for conformity is not attributable to a difference in choice overload, for instance, between the control group and the treatment group.

Table 13: ANCOVA results (study 2)

	DV: Degree of uniqueness					
	Hedonic attributes			**Utilitarian attributes**		
	F-value	**Significance**	**Partial Eta Squared**	**F-value**	**Significance**	**Partial Eta Squared**
Experimental group	4.060*	0.046	0.038	22.925***	0.000	0.181
Age	1.240	0.268	0.012	0.462	0.498	0.004
Gender	0.208	0.650	0.002	0.035	0.852	0.000
Educational degree	2.447	0.121	0.023	0.007	0.934	0.000
Need for uniqueness	0.178	0.674	0.002	1.558	0.215	0.015
Choice overload	0.690	0.408	0.007	0.049	0.826	0.000
R^2			0.094			0.204

n = 111
* p < .05
** p < .01
*** p < .001

5.5.4 Discussion

In study 2, I was able to replicate the findings from study 1 within a different product category, that is, sports shoes, again showing that consumers also seek conformity, not only uniqueness, in mass customization. Further, I tested and confirmed my hypotheses whereby consumers seek differentiation, or even uniqueness, in the hedonic attribute of a product (H_1), while striving for conformity in the utilitarian attribute (H_2). Both relationships were robust against influences of the need for uniqueness and choice overload as potentially confounding covariates. This finding contributes to the understanding of mass customization, first, by adding conformity as a driver of consumer choice and, second, by identifying contingencies of utilitarian and hedonic benefits causing either conformity or uniqueness.

Besides the support for hypotheses H_1 and H_2, I made some additional observations. First, the observed proclivity towards uniqueness has a relatively weak effect size. This stands in opposition to past research on mass customization that identified uniqueness to be a relevant driver of product value (Franke and Schreier, 2008, Merle et al., 2010). One reason for the weak effect may be the participants' preferences. They may have had a strong preference for a particular color or shoe design and may have been willing to accept an obvious loss of product uniqueness. Moreover, participants in my MTurk studies could have been less extroverted (Goodman et al., 2013), which may negatively influence their need for uniqueness. Therefore I need to counter these potential shortfalls by minimizing the influence of preference fit and utilizing a different data source than MTurk in my next experiment.

Second, I did not identify any considerable influence of consumers' need for uniqueness on the observed choice behavior. This may have two reasons: Either consumers prefer unique options in hedonic attributes independent of their individual need for uniqueness, or a more differentiated perspective on the individual need for uniqueness is required. Consumers' need for uniqueness and their desire to express this need in products differs between product types (Berger and Heath, 2007). For example, while some consumers with a high need for uniqueness may prefer to wear unique shoes, others may rather prefer to drive unique cars or travel to unique destinations. Thus, in my next study I account for these product-specific differences in consumers' need for uniqueness.

Finally, the generalization of the results of this study is limited. I tested the hypothesized relationships between uniqueness and hedonic attributes and conformity and utilitarian attributes in one specific product. However, the difference between hedonic and utilitarian perceptions of these attributes was rather weak. Therefore, I use an automobile configurator with a multitude of different hedonic and utilitarian attributes in order to test the robustness of the findings of this study.

5.6 Study 3: Testing moderators of the observed choice behavior

In the third study, I test the moderating effects of two personal characteristics – that is, consumers' product-specific need for uniqueness and product involvement – on consumers' choices in mass customization, as predicted in hypotheses H_3 and H_4. To minimize external influences and increase internal validity, I set up a laboratory experiment.

5.6.1 Method

I used the same experimental design for the control and treatment groups as in studies 1 and 2. I also re-used the self-developed configurator from study 2 that immediately visualizes changes made to the design, but adapted it to display a car instead of sports shoes (Figure 20). By choosing different combinations of domains and design tools for my three studies, I sought to increase the validity of my findings, showing that they do not depend on either the domain or the customization tool chosen. Besides that, cars have been effectively used in previous studies of hedonic versus utilitarian product attributes (e.g., Dhar and Wertenbroch, 2000, Voss et al., 2003).

I integrated six product attributes into the configurator. I expect the attributes exterior color, seat design, and the design of the wheels to primarily convey hedonic benefits to consumers. By contrast, the attributes engine, functional extras, and additional services should primarily provide utilitarian benefits to consumers (Table 14). As mentioned before, I was allowed to adapt and use material (pictures and descriptions) related to the BMW 1 series for the visualization of these attributes. By showcasing a real car model, I sought to create a realistic customization experience.

Both groups received the following instructions on the customization page (the last two paragraphs were only shown to the treatment group):

"Imagine you are interested in buying a compact car for private use. Please use the tool below to configure a car according to your preferences.

Please think carefully about your choices and choose those items that you prefer most - as if you were really going to buy the car. For each category you are allowed to select one option.

Please note that the options are ranked by popularity from left to right in each category: The number below each option tells you how often this option had been chosen by others, from "1st" being the option chosen most frequently by others to "6th" (or "8th" in some categories) being the option chosen least frequently by others.

For example, most of the others chose black (1st) as exterior color, but almost no one selected silver white (8th)."

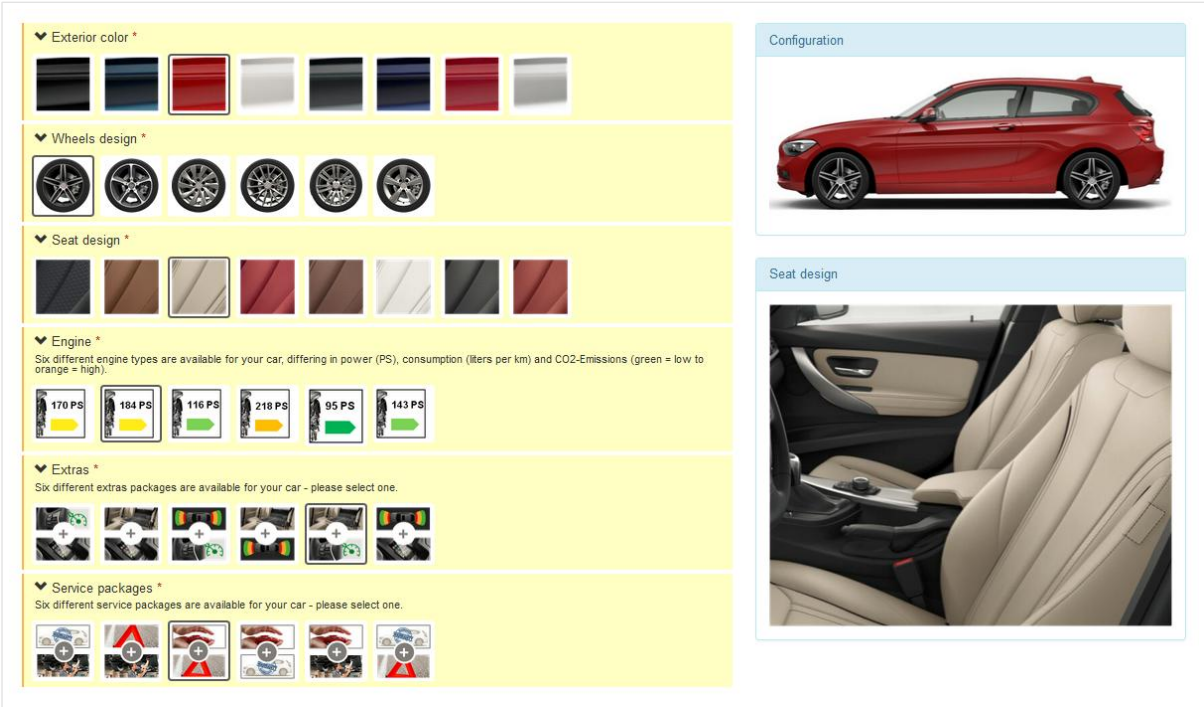


Figure 20: User interface of the car configurator (study 3)

To minimize the potentially confounding effect of preference fit, which may have played a role in Study 2, I now offered *pairs* of similar colors for the car exterior and the seats. As shown in Figure 20, there were two shades of black, red, white, etc., which differed in their displayed degree of popularity. This allowed participants to choose a more or less popular color without having to give up their proclivity to a certain color altogether.

Table 14: Overview of the solution space of the car configurator (study 3)

	Attribute					
Option	**Exterior color**	**Seat design**	**Wheel design**	**Engine**	**Extras**	**Service package**
1	Black 1	Black 1	5 spokes (design 1)	70kW (90PS) 4.1-4.6 l/100km CO_2 102g/km	Foldable rear seats + park distance control	Full insurance + extended warranty
2	Black 2	Black 2	10 spokes (design 1)	85kW (116PS) 4.5-5.0l/100km CO_2 102g/km	Foldable rear seats + cruise control	Full insurance + road assistance
3	Blue 1	Brown 1	7 double spokes	105kW (143PS) 4.8-5.4 l/100km CO_2 118g/km	Foldable rear seats + phone integration	Full insurance + inspection service
4	Blue 2	Brown 2	10 spokes (design 2)	125kW (170PS) 5.2-5.9l/100km CO_2 125g/km	Park distance control + cruise control	Extended warranty + road assistance
5	Red 1	Red 1	5 spokes (design 2)	135kW (184PS) 5.8-6.7 l/100km CO_2 132g/km	Park distance control + phone integration	Extended warranty + inspection service
6	Red 2	Red 2	5 double spokes	160kW (218PS) 6.6-7.8l/100km CO_2 151g/km	Cruise control + phone integration	Road assistance + inspection service
7	White 1	White 1				
8	White 2	White 2				

Experiment sessions were conducted in June 2014 at experimenTUM, laboratory for experimental economics, Technische Universität München, Munich, Germany. Instructions to all participants were standardized. Overall, 134 students took part in the experiment and were randomly assigned to one of the two groups. I excluded 3 participants from the data set because their responses to questionnaire items had a noticeable pattern (SD < 0.3 between the items), resulting in 66 subjects in the control group and 65 subjects in the treatment group (average age: 22.7 years; 30.5% females). Participants were compensated with 6 Euros each. The average time they spent on the configurator-cum-questionnaire and the configurator was 21.5 minutes (SD = 5.4).

5.6.2 Measurement

Degree of uniqueness. I re-used the logic from study 2, but instead of using text labels to indicate the popularity of an option, I simply ranked the options from least frequently chosen to most frequently chosen, i.e. 1 to 6 (1 to 8 for exterior color and seat design). This gave me even more precision in the dependent variable than in studies 1 and 2. In addition, to avoid any possible confusion, I added two text labels, *"1 - most frequently chosen"* and *"8 - least frequently chosen."* For commensurability in my analyses and for comparability with the other variables, I later normalized the 1-to-6 and 1-to-8 scales to represent a 7-point Likert scale ranging from 1 (most frequently chosen) to 7 (least frequently chosen). The mean values for each group were again termed as degree of uniqueness.

Hedonic and utilitarian benefits. Similar to the previous study I adapted the scale by Voss et al. (2003). Due to the number of attributes (six in total) participants were required to evaluate I limited the number of semantic differential pairs to four items per attribute: *helpful/unhelpful, functional/not functional, fun/not fun, enjoyable/unenjoyable*. The first two pairs represented the utilitarian benefits of each product attribute whereas the latter two pairs assessed the hedonic benefits that consumers assign to an attribute.

Moderators. In order to determine participants' product involvement, I applied the measurement scale from Zaichkowsky (1985) with six semantic differential pairs (Table 15). For the second moderator, product-specific need for uniqueness, I developed a separate scale as none of the existing ones provided an appropriate fit. The self-developed scale consisted of three items that aim to measure participants' need for a specific product type, which in this case was an automobile (Table 15). In order to achieve high reliability, the new scale was mainly based on the perceived uniqueness scale from Franke and Schreier (2008), as this scale showed good reliability and was developed in the specific context of mass customization. In addition, I utilized nomenclature of the desire for unique consumer products scale (Lynn and Harris, 1997a) to adjust the meaning of the items towards the desire for unique cars.

Control variables. I retained the additional measurements of choice overload (Walsh et al., 2007), gender, and age from the previous studies. Descriptive results, scale reliabilities, and correlations between variables are presented in Table 16.

Table 15: Measurement of moderators (study 3)

Variable	Source	Items
Product involvement	Voss, Spangenberg and Grohmann, 2003	Semantic differential pairs: 1. important/unimportant 2. matter to me/do not matter 3. useless/useful 4. not needed/needed 5. essential/nonessential 6. boring/interesting
Product-specific need for uniqueness	Adapted from Franke and Schreier, 2008 and Lynn and Harris, 1997a;	1. For me it is important that the car I drive is really special. 2. I like my car to be perceived as unique by others. 3. I prefer a car that is one of a kind.

Table 16: Descriptive statistics, reliability, and correlations (study 3)

	Variable	Mean	SD	α	1	2	3	4
1	Age	22.74	3.76	-				
2	Gender	0.31	-	-	-0.01			
3	Choice overload	2.86	1.23	0.67	-0.04	0.12		
4	Product involvement	4.98	1.15	0.84	-0.07	-0.09	-0.14	
5	Product-specific NFU	3.54	1.48	0.81	-0.09	0.03	-0.09	0.25**

n = 131
** $p < .01$

5.6.3 Results

Again, no significant differences in the observed variables between the two experimental groups can be identified (Table 17), indicating that both groups possess comparable characteristics.

Table 17: Test for differences between the control and treatment groups (study 3)

	Control group (n = 66)		Treatment group (n = 65)		T-value (2-tailed)
	Mean	SD	Mean	SD	
Age (years)	22.73	3.03	22.75	4.41	0.040 (n.s.)
Share of females	33.3%	-	27.7%	-	0.697 (n.s.)
Product involvement	4.96	1.15	5.01	1.16	0.200 (n.s.)
Product-specific NFU	3.59	1.49	3.49	1.47	0.380 (n.s.)
Choice overload	2.69	1.13	3.04	1.30	1.663 (n.s.)

Next, I validate if the presumed perception of utilitarian and hedonic benefits of the six attributes was correct. This was the case. Participants assigned predominantly hedonic benefits to the attributes exterior color, seat design, and wheel design, while they rated the engine, the extras, and the service package as providing primarily utilitarian benefits. As data again does not exhibit normal distribution, Wilcoxon signed rank tests are used to test for the significance of the differences. The difference in perception is significant for five out of six attributes, except for the engine. However, as expected, participants rated this attribute as being more utilitarian than hedonic in nature (Table 18).

Table 18: Test of the hedonic versus utilitarian benefits of the attributes (study 3)

Attribute	Primary benefit	Utilitarian benefit Mean (SD)	Hedonic benefit Mean (SD)	Wilcoxon test (2-sided)
Exterior color	Hedonic	4.42 (1.20)	5.48 (1.02)	$p < .001$
Seat design	Hedonic	4.79 (1.32)	5.45 (1.12)	$p < .001$
Wheel design	Hedonic	4.15 (1.22)	4.97 (1.27)	$p < .001$
Engine	Utilitarian	5.56 (1.03)	5.43 (1.35)	n.s.
Extras	Utilitarian	6.49 (0.81)	5.21 (1.27)	$p < .001$
Service package	Utilitarian	6.40 (0.95)	3.87 (1.29)	$p < .001$

n = 131

Before empirically testing choice behavior in the six attributes, I visually inspect participants' choice behavior. Figure 21 plots the difference in choices between control and treatment group for each option. Options are ordered as presented in the treatment group from most frequently chosen (left) to least frequently chosen (right). For the three hedonic attributes, participants' choices in the treatment group shifted towards the right when compared to the control group, indicating a proclivity towards unique options. By contrast, for the three utilitarian attributes, preferences moved away from unique options towards options that were labeled as being more frequently chosen by others. This visual inspection provides further support for hypotheses H_1 and H_2, which state that consumers prefer uniqueness in hedonic attributes and conformity in utilitarian attributes of their customized product.

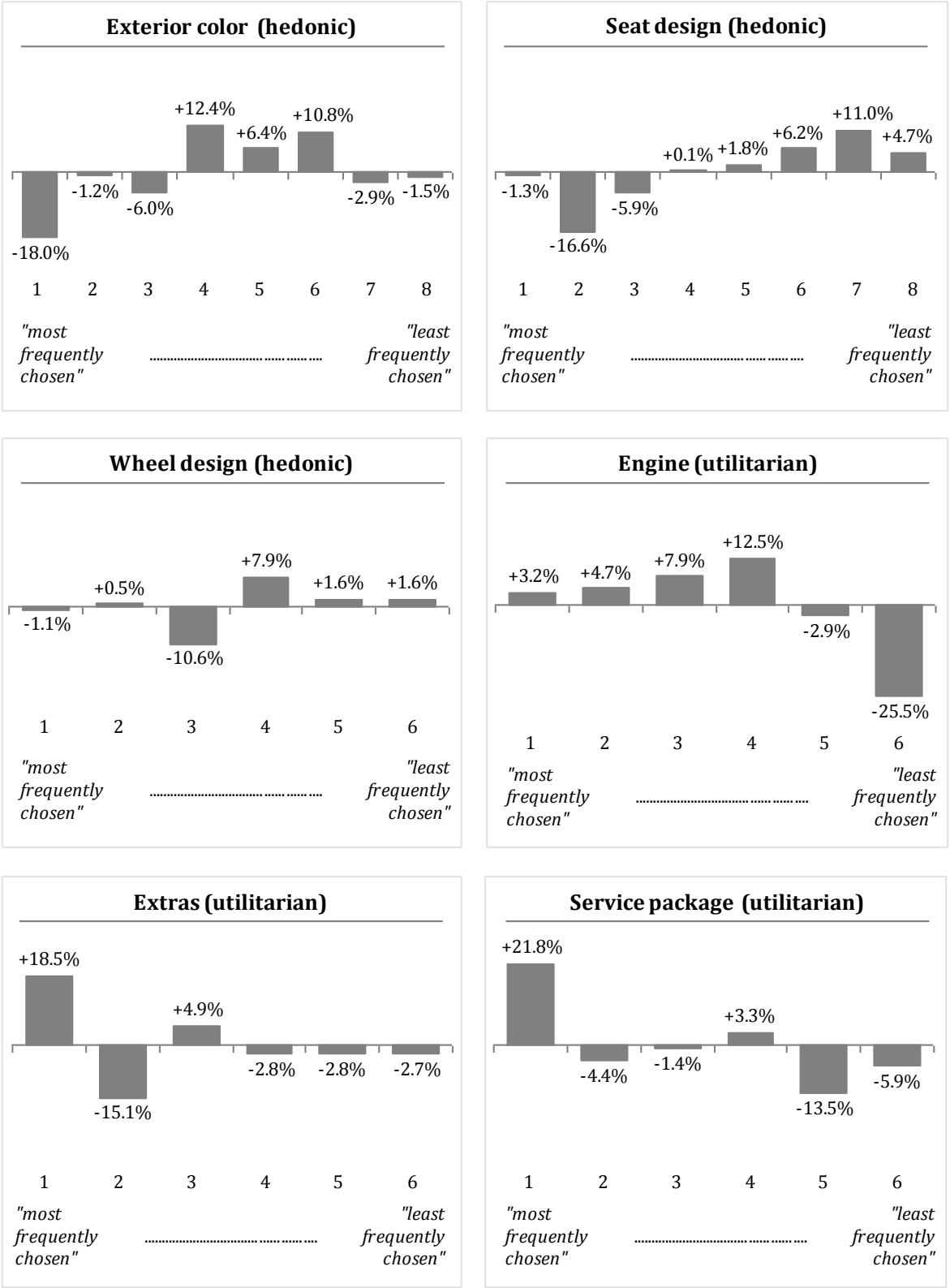


Figure 21: Differences in choices (%) between control and treatment group (study 3)

The results in study 3 are consistent with those from study 2, providing further support for hypotheses 1 and 2. Again, I find that the degree of uniqueness is *higher* in the treatment group than in the control group if and as the product attributes are perceived as hedonic in nature. This is particularly the case for the exterior color, the seat design, and the wheel design. Conversely, the degree of uniqueness is *lower* in the treatment group than in the control group if and as the product attributes are perceived to be utilitarian. This is illustrated by choices related to the engine, extras, and service package (Figure 22). Again, as the degree of uniqueness is measured on an ordinary scale, I conduct Mann-Whitney-U-tests for each attribute to assess the significance of these findings (Table 19). In four out of the six attributes, the difference in the means of the degree of uniqueness between the treatment and control groups is significant (exterior color: $Z = 2.250$; $p < .05$; seat design: $Z = 2.499$; $p < .05$; engine: $Z = 2.903$; $p < .01$; service package: $Z = 2.654$; $p < .05$). In the attributes wheel design and extras, the difference remains insignificant (wheel design: $Z = 0.485$; n.s.; seat design: $Z = 1.176$; n.s.).

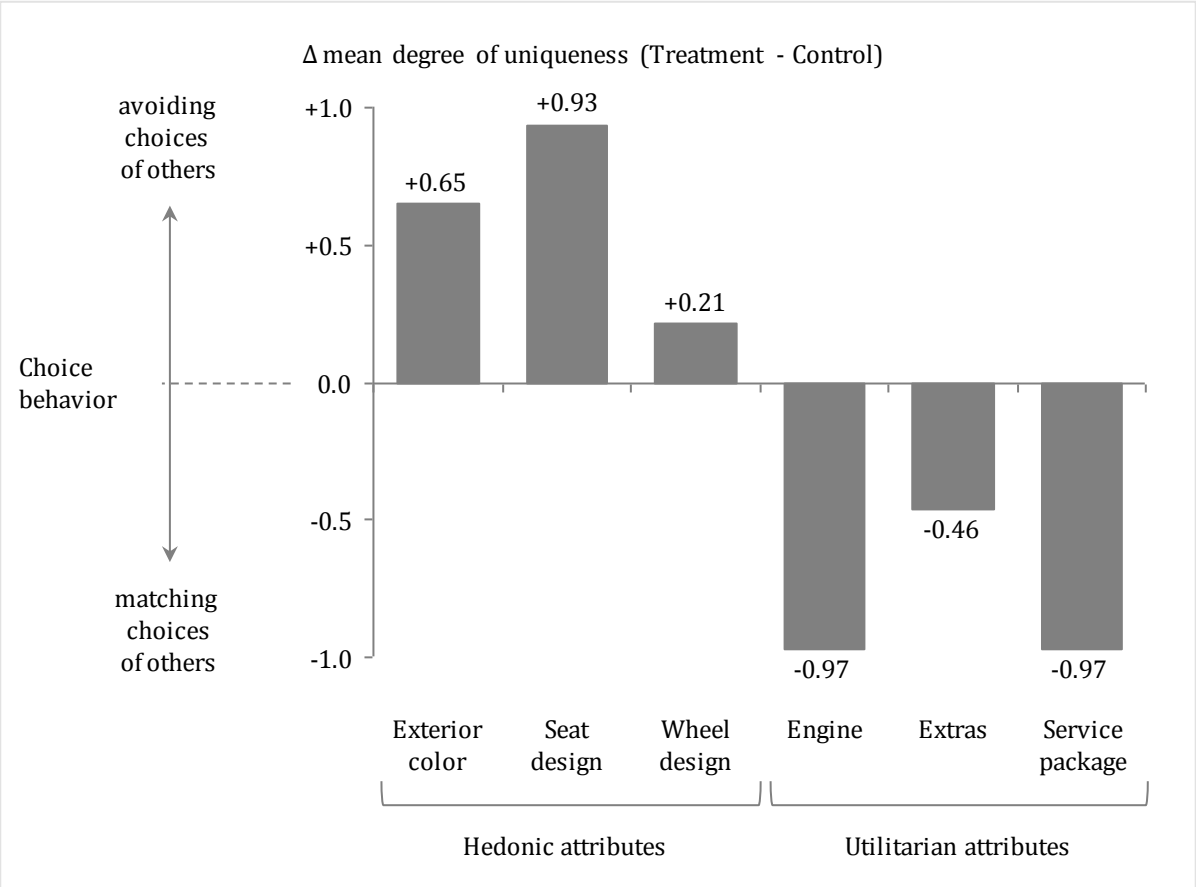


Figure 22: Difference in the degree of uniqueness between the experimental groups (study 3)

Table 19: Differences in choice behavior between the control and treatment groups (study 3)

Primary benefit	Attribute	Degree of uniqueness[a] Control (n=66)		Degree of uniqueness[a] Treatment (n=65)		Δ Means Treatment vs. Control	Mann-Whitney-U-test (2-sided)
		Mean	SD	Mean	SD		
Hedonic	Exterior color	2.96	1.87	3.61	1.61	+0.65	p < .05
	Seat design	3.39	1.97	4.32	2.05	+0.93	p < .05
	Wheel design	2.76	1.73	2.98	1.89	+0.21	n.s.
	Hedonic mean	*3.04*	*1.05*	*3.64*	*1.14*	*+0.60*	*p < .01*
Utilitarian	Engine	5.22	2.04	4.25	1.93	-0.97	p < .01
	Extras	4.56	1.88	4.10	2.17	-0.46	n.s.
	Service package	4.02	2.15	3.05	2.14	-0.97	p < .01
	Utilitarian mean	*4.60*	*1.22*	*3.80*	*1.29*	*-0.80*	*p < .001*

[a] scaled from 1 to 7, with 7 indicating maximum possible degree of uniqueness of the customized product

Moving on to the analysis of the moderators of consumers' choices, the principal goal of study 3, I consider the effects of product involvement and product-specific need for uniqueness. To do so, I conduct a 2x2x2 ANCOVA – control group vs. treatment group, low vs. high product involvement (i.e., below or above its median value of 5.17), and low vs. high product-specific need for uniqueness (i.e., below or above its median of 3.33), with covariates being age, gender, and choice overload (Table 20). I use the median to distinguish between high and low conditions of the moderating variables as this procedure has also been previously applied by other scholars (cf. Voss et al., 2003, Chitturi et al., 2008). The dependent variable is the degree of uniqueness that is calculated separately for the hedonic attributes and the utilitarian attributes. The reason for this is that I observed similar choice behavior within these two attribute types, pointing towards unique options for all hedonic variables and towards popular options for all utilitarian variables, and I expect the effects of the moderating variables to be similar among the hedonic and utilitarian attributes but to differ between these types of attributes.

Table 20: ANCOVA results in the hedonic and utilitarian attributes (study 3)

	DV: Degree of uniqueness[a]					
	Hedonic attributes			Utilitarian attributes		
	F-value	Significance	Partial Eta Squared	F-value	Significance	Partial Eta Squared
Experimental group	9.603**	0.002	0.073	11.141**	0.001	0.084
Product involvement	0.013	0.909	0.000	4.451*	0.037	0.035
Product-specific NFU	0.852	0.358	0.007	1.417	0.236	0.011
Experimental group * product involvement	0.047	0.828	0.000	0.409	0.524	0.003
Experimental group * product-specific NFU	4.242*	0.042	0.034	0.184	0.669	0.002
Age	0.120	0.730	0.001	0.086	0.770	0.001
Gender	0.007	0.936	0.000	3.632	0.059	0.029
Choice overload	0.087	0.769	0.001	0.923	0.339	0.008
R^2			0.114			0.174

[a] mean value across the three hedonic/utilitarian attributes (see Table 19)
n = 131
* $p < .05$
** $p < .01$

Results of the ANCOVA support my hypothesis H_4 but not hypothesis H_3. I find a significant interaction effect between experimental group and product-specific need for uniqueness ($F = 4.242$; $p < .05$), which indicates that participants with a high product-specific NFU showed a stronger preference for unique options in the hedonic attributes. Figure 23 illustrates this effect: Customized cars of participants who stated a high product-specific need for uniqueness and who knew about the popularity of the options (i.e. who were in the treatment group) had a higher degree of uniqueness in the hedonic product attributes. Thus, hypothesis H_3 is supported. I also tested the influence of this interaction within the utilitarian attributes. However, the effect is not present within these attributes ($F = 0.184$; n.s.), indicating that product-specific NFU intensifies consumers' choice preferences for unique options in the hedonic attributes but does not prevent consumers from selecting popular options in the utilitarian attributes.

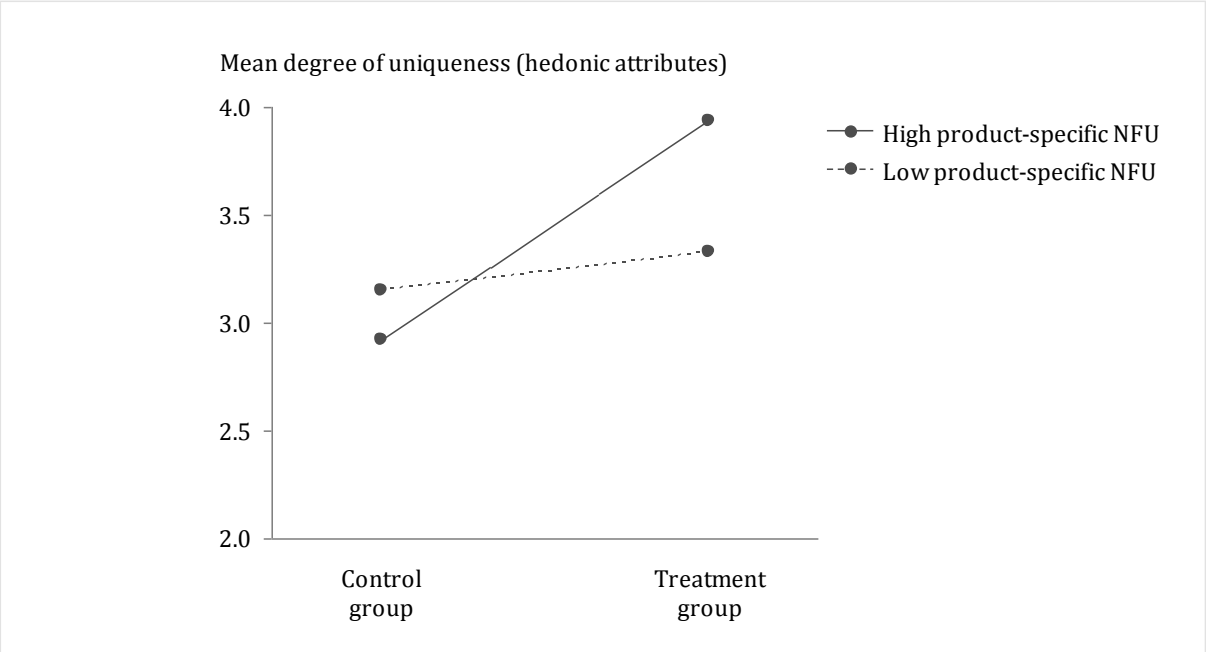


Figure 23: Influence of product-specific NFU within the hedonic attributes (study 3)

Furthermore, I expected that consumers with high product involvement show less conforming behavior than consumers with high product involvement do (H_3). This hypothesis is not supported as the interaction effect of experimental group and product involvement is not significant ($F = .409$; n.s.). Instead, I find a significant main effect of product involvement on the uniqueness degree in the utilitarian attributes ($F = 4.451$; $p < .05$). To further understand this effect, I inspect the degree of uniqueness in both experimental conditions (control versus treatment) and in both participant groups (low versus high product involvement). As it can be seen in Figure 24, the mean degree of uniqueness is considerably lower for highly involved participants in both experimental conditions compared to participants with low product involvement ($M_{C, high} = 4.29$ vs. $M_{C, low} = 4.87$; $M_{T, high} = 3.53$ vs. $M_{T, low} = 4.07$), which represents the identified main effect in the ANCOVA. This indicates that participants with high product involvement chose specific options in the utilitarian product attributes independently of being informed about the popularity. This finding suggests that the options in the utilitarian attributes were not perfectly balanced.

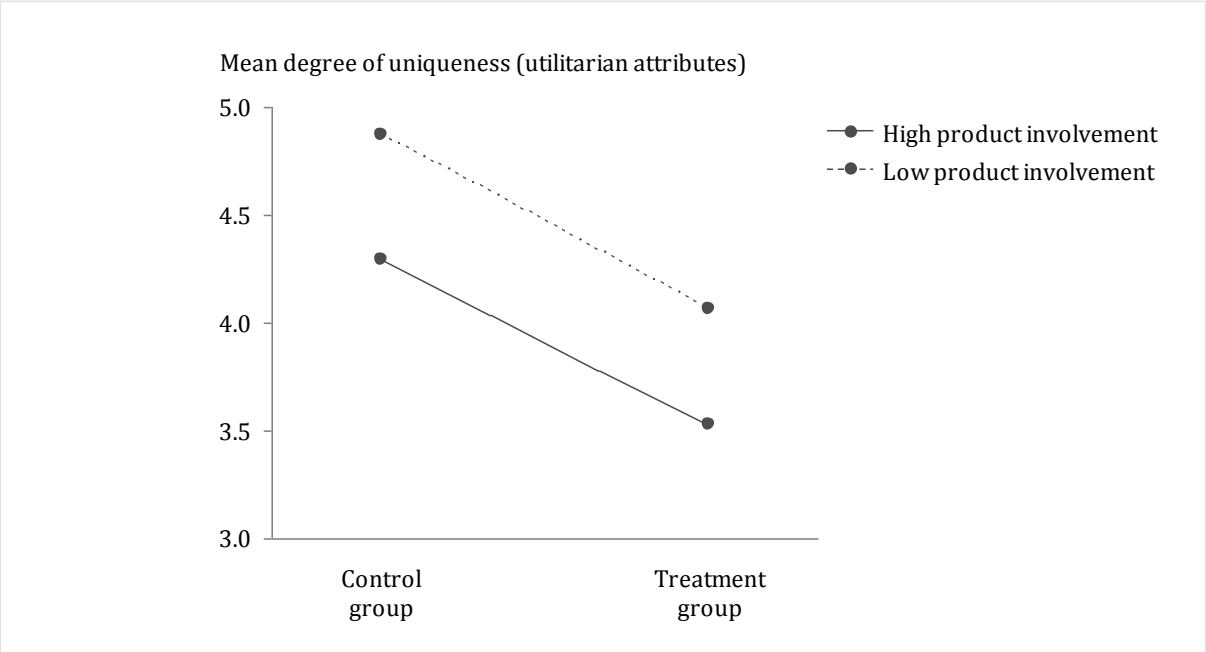


Figure 24: Influence of product involvement within the utilitarian attributes (study 3)

5.6.4 Summary

The laboratory experiment supports the findings of study 2 in a different product type, automobiles. I see again, a significant proclivity towards uniqueness in hedonic product attributes and a significant preference for conformity in utilitarian product attributes. I was able to identify the hypothesized pattern in all of the six product attributes: In all three hedonic product attributes, preference for uniqueness increased, while it simultaneously decreased in all three utilitarian attributes. Thus, I find additional support for hypotheses H_1 and H_2. In addition, I showed that consumers' product-specific need for uniqueness (H_4) intensifies the preference for uniqueness in the hedonic attributes but not in the utilitarian attributes. Finally, product involvement does not weaken the preference for conformity as hypothesized (H_3).

5.7 Study 4: Investigating the impact of choice behavior on preference fit

The last three studies proved that consumers of customized products choose differently when receiving information about the popularity of options. However, this change in choices might negatively affect the central value driver of mass customization: the perceived preference fit (Randall et al., 2007, Franke et al., 2009). By providing

information about the popularity of options to consumers, they no longer choose what they like but rather choose what others liked or disliked. As a result, this behavior might ultimately affect the preference fit of their customized product. However, consumers learn about their own preferences during customization (Franke and Hader, 2014) and often construct their preferences on the spot (Slovic, 1995). Therefore, they may form their preferences during the actual process of customization by incorporating the information about choices of others provided to them. If this is the case, the perceived preference fit should be comparable among the experimental groups. The following study investigates this ambiguity.

5.7.1 Method

This study is an extension of the online experiment on sports shoes (study 2). In addition to the control and the treatment group of study 2, I introduced two supplementary groups (see Figure 25 for an overview of the experiment).

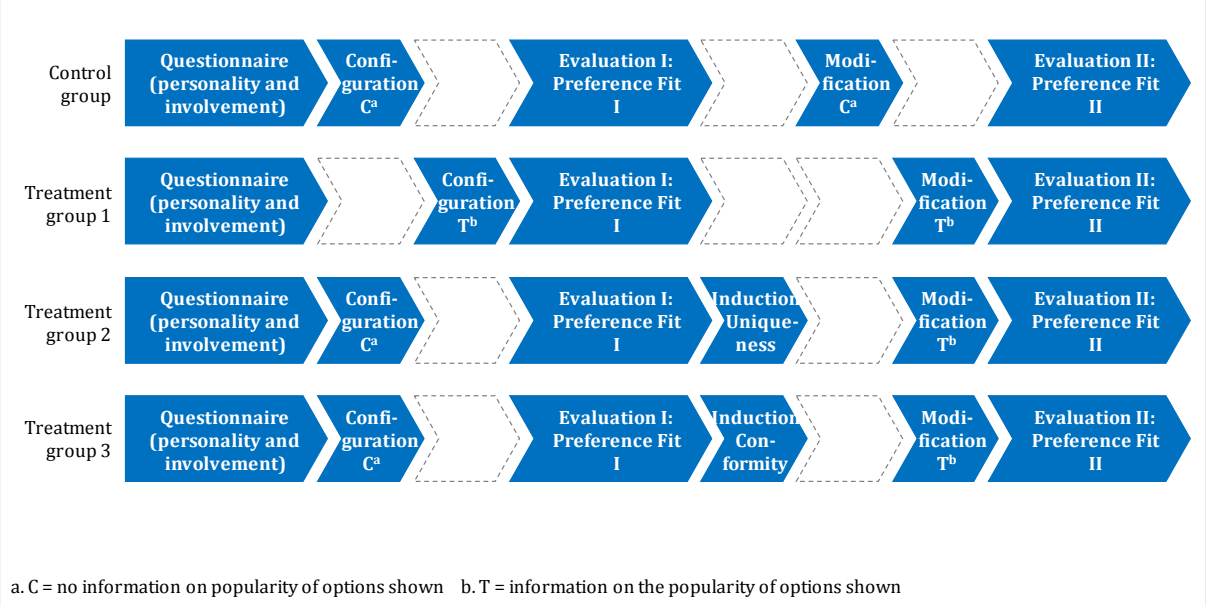


Figure 25: Experiment set up (study 4)

Participants in the treatment groups 2 and 3 received information about the uniqueness of their customized product after they finished customization. They then had the opportunity to apply changes to their designs. This confronted them with a potential conflict between preference fit on the hand and their desire towards uniqueness and

conformity on the other hand. After finalizing their product, they received the following manipulated evaluation of their customized shoe design:

> *"For your information, your shoe design was compared with the designs created by others. The result was:*
>
> *Almost no one chose a design very similar to yours.*
> *(Uniqueness induction in treatment group 2)*
>
> *Many others chose a design very similar to yours.*
> *(Conformity induction in treatment group 3)*
>
> *Your configuration is shown below. The labels below each option indicate how frequently each of the options had been selected by others. If you like you can modify your design below or stick to your original choice (which is highlighted by a grey frame in each category)."*

If preference for uniqueness and conformity, respectively, dominates preference fit, treatment group 2 and 3 should modify their designs according to the findings from the previous studies. Thus, I expect subjects in treatment group 2 to change their choices in the utilitarian attribute of their shoes (i.e. the absorption type) towards popular options, as they receive the information that they have created a highly unique configuration and I observed that consumers do not prefer to be unique in the utilitarian attribute. By contrast, I expect participants in treatment group 3 to modify the hedonic attribute of their shoes (i.e. the shoe design), because the manipulated evaluation of their design informs them about the similarity to the design of others and I found consumers to prefer unique options in this attribute type.

In total, 240 participants took part in the experiment (60 participants per group). I applied the same criterion as in study 2 in order to exclude participants that seemed to have rushed through the experiment (time < 5.8 minutes), resulting in 221 participants in total. The average time participants spent on the task was 10.5 minutes.

5.7.2 Measurement

Preference fit. I adapted the 3-item scale from Randall et al. (2007) to measure the perceived preference fit of participants (I am satisfied that the customized sports shoes would meet my needs. If I were to buy sports shoes in the near future, I would purchase essentially the ones I selected. I believe I found the sports shoes that would be best for me.). Items were measured on 7-point Likert scales.

Preference insight. Different levels of preference insight might affect consumers' perceived preference fit (Franke et al., 2009). Therefore, I measure consumers' preference insight in order to compare the level of preference insight between the four treatment groups. I applied the logic from Franke and Hader (2014) and asked the participants before the actual customization about their ideal choice for each attribute. Participants were able to either indicate a specific preference for an attribute (e.g., color of the laces) or leave the field empty. The resulting binary variable (0 = empty field; 1 = precise answer) reflects the level of preference insight of a participant for each attribute (0 = no insight; 1 = insight).

Control variables. Again I included several control variables into the experiment in order to test for any differences between the experimental groups. Besides age, gender, and educational degree, I tested for consumers' need for uniqueness. As described in study 2, I used the 6-item scale from Franke and Hader (2014).

5.7.3 Results

Again, I start by testing for inter-group differences. Table 21 provides an overview of the descriptive statistics of the four experimental groups. I conduct a chi-square test on the variable gender, which turns out to be insignificant ($\chi^2 = 3.456$; n.s.). Likewise, I conduct t-tests to identify any differences in age, educational degree, and need for uniqueness between the four groups. As none of the tests yield to significant results, I consider the groups to be sufficiently similar in their characteristics.

Table 21: Descriptive statistics of experimental groups (study 4)

	Control group Mean (SD)	Treatment group 1 Mean (SD)	Treatment group 2 Mean (SD)	Treatment group 3 Mean (SD)
n	55	56	49	61
Share of females	34.5%	51.8%	40.8%	42.6%
Average age (years)	33.18 (9.16)	33.73 (11.77)	32.82 (12.51)	34.23 (12.65)
Educational degree	3.82 (0.72)	3.79 (0.73)	3.74 (0.70)	3.67 (0.60)
Need for uniqueness	3.55 (1.63)	3.66 (1.42)	3.69 (1.44)	3.57 (1.49)

Furthermore, I analyze whether any significant differences in preference insight between the groups exist as this might affect results. For none of the product attributes

chi-square results are significant (Table 22), which indicates a comparable level of preference insight for all four groups. In general, participants have a high level of preference insight concerning the design of their shoes (≥ 68.9%) while having a low level of preference insight regarding the absorption type (≤ 25.0%).

Table 22: Preference insight of experimental groups (study 4)

	Preference insight = 1				
	Control group	**Treatment group 1**	**Treatment group 2**	**Treatment group 3**	**χ^2 result**
Base color	83.6%	92.9%	91.8%	93.4%	4.091 (n.s.)
Sole color	78.2%	85.7%	87.8%	93.4%	5.844 (n.s.)
Tongue color	70.9%	75.0%	79.6%	73.8%	1.068 (n.s.)
Laces color	81.8%	85.7%	93.9%	86.9%	3.407 (n.s.)
Lining color	69.1%	75.0%	79.6%	68.9%	2.143 (n.s.)
Absorption type	21.8%	25.0%	16.3%	19.7%	1.276 (n.s.)

Next, I investigate the level of perceived preference fit between the experimental groups. This variable was measured twice per group in the experiment: once directly after subjects finished their customization (preference fit I) and once after the (potential) modification of their configuration (preference fit II; see Figure 25). Reliability of this scale is high, with Cronbach's alpha values of $\alpha = 0.90$ for preference fit I and $\alpha = 0.91$ for preference fit II. In general, participants state a high level of preference fit after the initial customization (preference fit I: M = 5.29; SD = 1.30) as well as after the modification of their design (preference fit II: M = 5.50; SD = 1.34). To investigate the potential conflict between preference fit and consumers' need for uniqueness and conformity, I compare the perceived preference fit I of the control group, who customized their sports shoes without any induction, and treatment group 1, who customized significantly differently in both utilitarian and hedonic attributes. If preference fit is negatively affected through the change in choices, preference fit in the treatment group 1 should be significantly lower than in the control group. Otherwise, if consumers construct their preferences during customization, subjects in treatment group 1 should perceive the preference fit of their customized sports shoes similarly to those in the control group. However, no significant difference in means of the perceived

preference fit between both groups can be identified ($M_C = 5.34$; $M_{T1} = 5.23$; Mann-Whitney-U-test: Z = 1.013; n.s.).

Interestingly, in all four groups the perceived preference fit increased after participants had the opportunity to modify their design (Figure 26). The strongest increase ($M_{Fit\ I} = 5.27$; $M_{Fit\ II} = 5.73$) can be observed in treatment group 2, who received the information that their design was very unique. Out of the four groups, treatment group 2 is the only group where the increase is significant (Wilcoxon test for treatment group 2: Z = 4.171; p < .001).

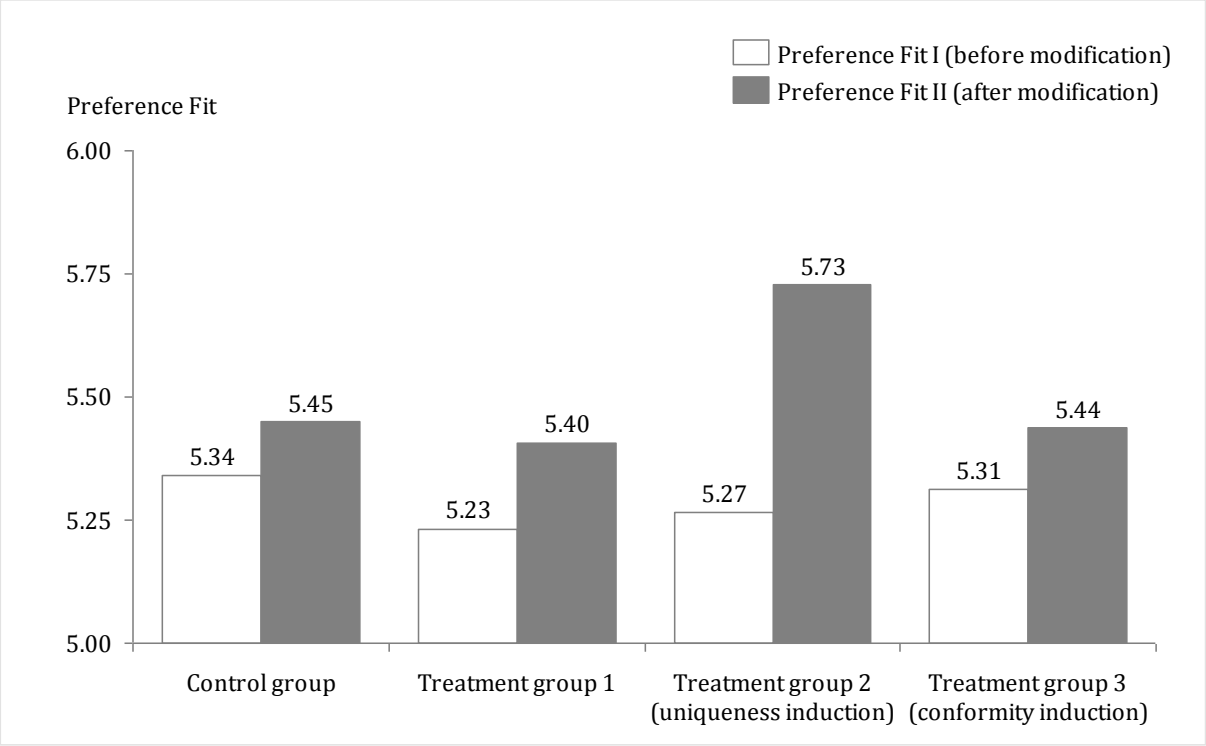


Figure 26: Perceived preference fit I and II in the experimental groups (study 4)

Besides that, I investigate subjects' tendency to modify their previously created design in the treatment groups 2 and 3 after inducing uniqueness and conformity. I compare the number of modifications of these groups in the hedonic and utilitarian product attributes to the number of modifications in the control group in order to control for any modifications that are not related to the induction. In general, only a minor amount of participants decided to modify their design across all four groups (maximum: 16.4% of participants in the treatment group 3 modified the sole color; see Table 23).

Although some participants modified their designs in the treatment groups 2 and 3, this number is not significantly higher compared to the control group. Subjects in the treatment group 2 were told that their design was very unique compared to the design of others. I expected them to modify the utilitarian product attribute (shock absorption type). However, results show that participants preferred to keep their design: I could not identify any significant differences in the number of modifications between the treatment group 2 and the control group in the utilitarian attribute (treatment 2: 6.1% vs. control: 3.6%; $\chi^2 = .350$; n.s.). Participants in treatment group 3 received the information that their design was very similar to those of others. I expected those participants to apply changes to the hedonic product attribute (shoe design). Again, the number of modifications in the hedonic attribute between the control group and treatment group 3 is insignificant (treatment 3: 21.3% vs. control: 18.2%; $\chi^2 = .178$; n.s.).

Table 23: Number of modifications in the experimental groups (study 4)

	Shoe design (hedonic)	**Absorption type (utilitarian)**
Control group (n = 55)	10 (18.2%)	2 (3.6%)
Treatment group 1 (n = 56)	12 (21.4%)	2 (3.6%)
Treatment group 2 (n = 49)	8 (16.3%)	3 (6.1%)
Treatment group 3 (n = 61)	13 (21.3%)	0 (0.0%)

n = 221

Finally, I investigate whether participants in the treatment groups 2 and 3 modified their designs towards uniqueness or conformity (Figure 27). As participants in the treatment group 2 were induced uniqueness, I expect them to modify the utilitarian product attribute (absorption type) towards conformity. Indeed, I observe a slight decrease in the degree of uniqueness in this attribute ($M_{\text{Utilitarian I}} = 3.63$ vs. $M_{\text{Utilitarian II}} = 3.45$), indicating conforming behavior. However, the difference is not significant (Wilcoxon test: Z = 1.604; n.s.). In contrast, subjects in the treatment group 3 received the information that their design is very similar to those of other participants. Thus, drawing on findings from my previous studies, I expect these participants to modify the hedonic product attribute (shoe design) towards uniqueness. Results support this proposition, as the mean degree of uniqueness in the hedonic attribute

significantly increased after the modification ($M_{Hedonic\ I} = 2.30$ vs. $M_{Hedonic\ II} = 2.45$; Wilcoxon test: $Z = 2.672$; $p < .01$).

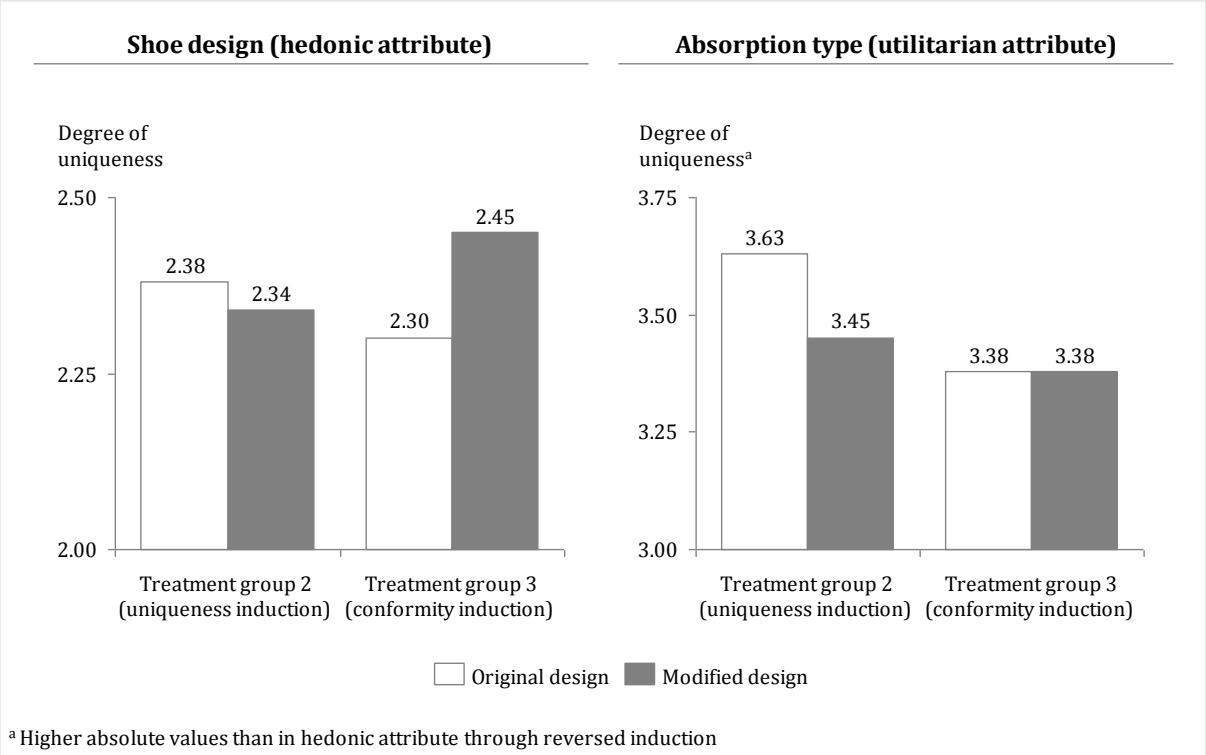


Figure 27: Change in degree of uniqueness in the treatment groups 2 and 3 (study 4)

5.7.4 Discussion

With this study I aimed to shed light on the potential conflict between preference fit and consumers' proclivity towards uniqueness and conformity in mass customization. For this purpose I extended the online experiment on sports shoes (study 2) by including two additional groups to the experiment. I provided manipulated information about the uniqueness of the customized product in treatment group 2 (high uniqueness) and treatment group 3 (low uniqueness) after participants completed customization, and gave them the opportunity to apply changes to their customized product. This procedure allowed investigating the mechanism of preference fit versus consumers' proclivity towards uniqueness and conformity.

Results indicate that there is no general conflict between the observed change in choice behavior and preference fit. Even though participants' choices in the control and the treatment groups significantly differed (see study 2 for details), both groups stated

similar levels of preference fit of their customized product. This observation is important as it demonstrates that consumers' choice behavior in customization can be manipulated without any loss in perceived preference fit. Thus, consumers seem to construct their preferences during customization based on the information provided to them. This is in line with the findings from Franke and Hader (2014) who identified that mass customization toolkits serve as preference learning instruments for consumers.

However, it is important to mention that the majority of consumers stated clear preferences regarding the design of their sports shoes, ranging from 68.9% to 93.9%. Despite these high values, participants still significantly switched their choices in this product attribute towards options that were labeled as unique. To conclude, even consumers who think to have clear preferences seem to be highly susceptible to choices of other consumers.

Furthermore, I investigated the modifications participants applied to their designs. In the treatment group 2 (uniqueness induction), no significant change in the uniqueness of participants' design could be observed. Participants kept their choices in the utilitarian product attribute and no longer pursued conformity. Thus, once preferences have been constructed in customization, they are much less manipulable and consumers no longer conform to others. By contrast, subjects in treatment group 3 (conformity induction) significantly modified their shoe design towards uniqueness. This finding indicates that consumers are at least partly willing to sacrifice their constructed preferences in order to have a unique product.

Besides that, this study contains another interesting finding: mere information about the uniqueness of the customized product significantly increases preference fit. Treatment group 2 received the manipulated information that their design is highly unique. This information led to a significant increase in preference fit, which could not be observed in any other of the experimental groups. Consequently, highlighting the uniqueness of the customized product after consumers completed customization seems to enhance consumers' evaluation of the customized product. This finding is particularly relevant for companies that particularly promote the uniqueness value of customization in order to intensify consumers' perceived value of their customized product.

5.8 General discussion

This research investigated uniqueness and conformity as distinct drivers of consumers' choice behavior in mass customization. I posed the question of whether uniqueness is a unidirectional preference or whether the opposite, conformity, may even be preferred under some conditions. The results of four experimental studies show that conformity can be preferred over uniqueness in some cases. Furthermore, the findings have provided the insight that a desire for uniqueness arises for hedonic product attributes whereas utilitarian attributes attract conformity with others. Results are consistent across two different product types, sports shoes and automobiles.

So far, research in mass customization has focused exclusively on uniqueness as a value driver. My results show that consumer's need for conformity is an additional and highly relevant factor which influences choice behavior in product customization. This is especially true for customizable products that contain many utilitarian attributes. Examples are not only automobiles but also laptop computers, bicycles and other similar items. Here, the individual need for uniqueness seems to be less important than in products that provide primarily hedonic benefits.

I also exposed additional influencing factors on the observed choice behavior. Differentiating choice behavior in hedonic attributes is amplified by product-specific NFU, indicating that consumers use the hedonic attributes of a product to satisfy their (product-specific) need for uniqueness. However, consumers' product-specific need for uniqueness does not seem to influence choice behavior in the utilitarian product attributes. This confirms my proposition that consumers pursue their need for uniqueness primarily in hedonic product attributes. However, I saw that need for uniqueness is product-specific and needs to be distinguished from the construct of consumer’s general need for uniqueness (Tian et al., 2001) as I did not identify any significant relationship between consumer’s need for uniqueness and the observed choice behavior.

I did not find support for hypothesis H_3, where I proposed that the desire for conformity is weakened for highly involved consumers. One reason for not finding the hypothesized moderating effect might be that decisions on the product strongly matter to consumers that have a high level of product involvement (Zaichkowsky, 1985). Hence, they are interested in avoiding wrong decisions when customizing. This explanation is supported by findings from Ulrich, Anderson-Connell, and Wu (2003). In their

experiment, subjects who perceived clothing to include meaningful signaling effects felt less comfortable with customizing apparel, indicating that consumers are afraid of making the wrong decision. This might again trigger prevention orientation and evoke a systematic, risk-averse information processing (Florack et al., 2010) that includes thoughtful consideration of the choices of other consumers. Thus, highly involved consumers might rely on information about others' choices to the same degree as non-involved consumers and tend to choose what others have chosen in order to avoid potential mistakes in customization.

Finally, I uncovered that consumers, despite their shift in choices, do not perceive any loss in preference fit. Instead, if the uniqueness of their customized product is explicitly pointed out to consumers, the perceived preference fit significantly increases. This provides support for recent findings from Franke and Hader (2014) by showing that most consumers indeed construct their preferences during customization. Hence, for those consumers it is irrelevant whether they form their preferences by considering the choices of other consumers. In addition, this finding also expands upon prior research from Franke and Schreier (2008) by highlighting that perceived uniqueness does not only increase willingness-to-pay but also positively affects the preference fit in customization, which is seen as the major driver of consumer value (Franke et al., 2009). By contrast, my finding that most of the participants preferred to keep their design, independent of whether they were told it is unique or not, indicates stability of consumers' preferences after the completion of customization. Once they have constructed their preferences in the course of customization, consumers no longer seem to be willing to consider the choices of other consumers in order to adjust their customized product to any needs for uniqueness and conformity.

5.8.1 Contribution to theory

This part of my thesis contributes to the literature of mass customization and co-creation. I challenge and expand prior research on mass customization that identified product uniqueness as a key value driver of customized products. I add conformity as a driver of consumer choice and show that uniqueness and conformity are two forces pulling in opposite directions and jointly affecting choice behavior in mass customization. While literature has regarded mass customization as a tool for consumers to fulfill their need for uniqueness (Franke and Schreier, 2008, Merle et al.,

2010), my findings highlight that this picture is incomplete. More accurately, mass customization can be seen as a tool to realize the *optimal mix* between uniqueness and conformity and thus heal the contradiction between them. This may require that appropriate information is provided to the customers, i.e. they need to know the choices of others.

Moreover, the association of consumers' opposing needs with the hedonic and utilitarian attributes of products adds to research on co-creation (Fuchs and Schreier, 2011, Gemser and Perks, 2015) by indicating that the degree of uniqueness of consumer-developed solutions is contingent on the *characteristics* of the product attributes. My findings indicate that users pursue differentiation and look for extraordinary features in hedonic attributes of products while they prefer to rely on popular solutions in utilitarian attributes. This sheds new light on co-creation and may explain its success especially for hedonic products such as fashion (e.g., T-shirts, see Ogawa and Piller, 2006) or toys (e.g., LEGO, see Hienerth, Lettl, and Keinz, 2014, Jensen, Hienerth, and Lettl, 2014). It adds to the recent work by Stock, Oliveira, and von Hippel (2015), who showed that consumers' hedonic *motives* affect the novelty or uniqueness (these terms are used synonymously by research, cf. Nyström, 1985, Perry-Smith and Shalley, 2003) of their developed solutions. Thus, the outcome of a co-creation project might be contingent on the characteristics of the product. Participants of a co-creation project who anticipate that the new product primarily provides hedonic benefits are therefore likely to produce novel or unique solutions. By contrast, participants who focus on the utilitarian benefits in such a co-creation project might develop less novel solutions. Thus, depending on the characteristics of the development task, consumers' differing needs might affect the outcome of such a project.

Finally, I show that the *optimal mix* between uniqueness and conformity for any individual user of a MC toolkit is contingent on his or her product-specific need for uniqueness. Interestingly, and unlike previous research, I find no moderation of consumers' proclivity towards unique options by consumers' general need for uniqueness, but only by their product-specific need for uniqueness. A specific form of this construct seems particularly appropriate as consumers' need for uniqueness can vary across different product types.

5.8.2 Limitations and opportunities for future research

This research has several limitations that call for further investigation. I extended research on mass customization by advancing the understanding of the mechanism that underlies consumers' choices. This opens up three major directions which I would like to highlight as valuable extensions of this research.

The first and most important direction is to advance the understanding of the observed choice behavior in mass customization. As conformity is contradictory to the classical meaning of mass customization – to better cover consumers' heterogeneous needs than standard products do (Franke and von Hippel, 2003) – it is highly relevant to further assess the boundary conditions and consequences of this behavior. For example, it could be tested whether consumers' satisfaction and their willingness to purchase the customized product change under the observed shift in preferences. Likewise, do consumers' differing needs allow limitation of the solution space for utilitarian attributes to the most popular options without negatively affecting consumers' satisfaction? To what extent do consumers demand variety in hedonic attributes in order to satisfy their need for uniqueness? In addition, validating my findings in a real purchase setting would be important. I limited my studies to artificial setups, which did not require participants to purchase their customized product. Although external validity of laboratory experiments is considered to be high (Anderson et al., 1999), testing the effect in a real environment that involves the actual purchase of the customized product would be a valuable extension of my research.

The second direction points towards the identification of other determinants of choice behavior in customization. I focused on the induction of one specific type of information – that is, choices of other consumers – as well as the classification of hedonic and utilitarian benefits for consumers. However, choices in mass customization might also be influenced by other determinants. An important criterion might be the source of the information provided. For example, the effect of other consumers' choices might be different compared to recommendations from technical experts or design specialists and might even further intensify the observed behavior as consumers might rely more strongly on the opinion of these individuals. Likewise, other classifications of product characteristics such as the performance or reliability of attributes (Chernev, 2004) might also affect choice behavior. Thus, adding additional pieces of information to

the incomplete picture of choice behavior in mass customization would be of great value.

The third central limitation of my study relates to the interplay between consumers' conflicting needs and the value drivers of mass customization that have been identified by prior research (cf. Schreier, 2006, Franke et al., 2009, Merle et al., 2010). For example, it would be of interest whether the change in preferences leads to increased task enjoyment. Past research identified process enjoyment to be a significant independent contributor to the value of mass customization (Franke and Schreier, 2010). As discussed above, the change in preferences might reflect an increase in regulatory fit for consumers (Freitas and Higgins, 2002), which may positively affect task enjoyment in customization (Jia and Wang, 2010, Wang, Kandampully, and Jia, 2013). Thus, it seems likely that providing consumers with information about the choices of other consumers boosts their perceived process enjoyment. Moreover, my study assessed the effect of the observed change in choices concerning preference fit. As information about the uniqueness of the customized product led to a significant increase in perceived preference fit and as this driver is considered to be a major contributor to consumers' willingness-to-pay (Franke and Piller, 2004, Franke et al., 2009), the observed choice behavior is likely to increase consumers' willingness-to-pay. However, by choosing what others have chosen in the utilitarian attributes, consumers' feeling of creative achievement might suffer, which is another important value driver in customization (Franke et al., 2010b). Discovering how the change in choices affects consumers' perceptions of product and process value as well as their willingness-to-pay in mass customization would be a valuable area for future research.

So far I investigated consumers' interest in mass customization as well as their choice behavior during customization. However, the studies I conducted so far lack two aspects: First, although I analyzed consumers' perception of the value of mass customization before and during the process, their perception of the customized product and the design process, once completed, was not analyzed. This is important in order to gain a complete picture of the value of mass customization from the consumers' perspective. Second, my studies were limited to artificial environments and did not involve actual consumers of customized products. As stated by Fogliatto et al. (2012), validating the value of mass customization in a real environment is highly relevant for advancing this research stream. Therefore, in the next part, I aim to gain a complete picture of the consumers' point of view on mass customization. Hence, I survey actual

users of a commercial configurator and gain information on their perceptions of their customized product as well as on the customization process. Furthermore, my previous studies showed that consumers' interest and behavior before and during the process differ depending on personality factors. This led me to also integrate consumer-specific characteristics into the following study in order to assess their influence on consumers' perception of value after they have completed the process.

6 Part III: Consumer-specific antecedents of the perceived value of mass customization

6.1 Introduction

Consumers benefit from mass customization because they get exactly what they want (Schreier, 2006), thereby increasing the coverage of their needs (Franke et al., 2009). Simultaneously, consumers who are given the freedom to choose from a large variety of options often feel confused and have difficulties making a decision (Iyengar and Lepper, 2000, Broniarczyk and Griffin, 2014). Contrastingly, this reduces their satisfaction and threatens the aforementioned benefits. Mass customization substantially increases the number of options for consumers and bears the risk of mass confusion (Huffman and Kahn, 1998). As suggested by Dellaert and Stremersch (2005: p. 226), *"complexity may have the character of an individual trait rather than a task-specific effect"*. Therefore it is required to investigate under which contingencies mass customization is really beneficial for consumers.

As already presented in chapter 2.5 of this dissertation, mass customization provides an increase in value to consumers, heightening their willingness-to-pay (e.g., see Franke and Piller, 2004, Franke and Schreier, 2008, Franke et al., 2009, Franke and Schreier, 2010, Franke et al., 2010b). This value increase can be split into two main dimensions: product- and process-related benefits for consumers (Merle et al., 2010). While product-related benefits (preference fit, uniqueness, and self-expression; see section 2.5.2 for details) are generated through the customized product itself, process-related benefits (process enjoyment and feelings of authorship; see section 2.5.3 for details) emerge from the customization activity. Although preference fit is seen as major value driver for customized products (e.g., see Randall et al., 2007, Franke et al., 2009), recent findings indicate that the enjoyment consumers experience during the process of customization is also a substantial contributor to the perceived value (e.g., see Franke and Schreier, 2010, Merle et al., 2010).

These value drivers are threatened by cognitive overload, which is a result of choice complexity (see section 2.5.4). The issue of choice complexity in consumer environments has been discussed by a rich body of literature (e.g., see Iyengar and Lepper, 2000, Iyengar et al., 2004, Greifeneder, Scheibehenne, and Kleber, 2010, Kuksov and Villas-Boas, 2010, Scheibehenne et al., 2010, Broniarczyk and Griffin, 2014). Iyengar and Lepper (2000) showed that consumers are less satisfied and the likelihood of purchase decreases when the number of options increases above a certain threshold. As mass customization requires an increased number of choices from consumers, it increases the complexity of consumers' product decision (Dellaert and Stremersch, 2005). This increase in complexity can lead to feelings of being overloaded, which has also been termed as *"mass confusion"* in past research (Teresko, 1994, Huffman and Kahn, 1998). It has been shown that overload also negatively affects satisfaction with the customized product (Matzler et al., 2011).

This conflicting influence of the value drivers on the one hand and cognitive overload on the other hand is likely to be contingent on consumer-specific characteristics. As stated by von Hippel and Katz (2002), consumers must have specific needs in order to profit from toolkits that allow them to design their own product. However, it is likely that not all consumers possess these needs and thus the perceived value of such toolkits differs between consumers. This has also been emphasized by Franke and Schreier (2010: p.1030): *"another necessary research task would be to analyze which types of customers are likely to be impacted by which sources of value [product and process; author's note]."* Indeed, some initial support for this proposition can be found in past research. For example, Fiore et al. (2004) identified an increased motivation to use mass customization for fashion clothing when consumers' optimum stimulation level is high. Other scholars provide first indications that consumers' need for uniqueness and optimization (Hunt et al., 2013) as well as their preference insight and product involvement (Franke et al., 2009), influence the value of mass customization. Drawing on this, I expect the product and process value as well as the perceived cognitive overload to depend on consumer-specific characteristics.

For consumers, the central benefit of mass customization is to be able to get exactly what they want (Pine et al., 1995), which allows for an increased preference fit (Franke et al., 2009). However, this requires consumers to value the benefit of receiving a product that better satisfies their preferences than standard products would do. I expect this to particularly hold true for two types of consumers: maximizers and lead

users. Maximizers are likely to benefit from mass customization as it gives them the possibility to get exactly what they want (Schreier, 2006), although they have also been recognized to experience difficulties in making decisions (Schwartz, Ward, Monterosso, Lyubomirsky, White, and Lehman, 2002). Therefore, maximizers are likely to experience cognitive overload as the number of decisions in mass customization is considerably higher for them than in normal consumption situations, questioning the benefits of mass customization for maximizers. By contrast, lead users have been seen to primarily profit from obtaining the actual physical product that better satisfies their needs (Urban and von Hippel, 1988). However, research on voluntary participation of users in open innovation projects shows that these users also engage in such projects because they simply enjoy this task (Lakhani and von Hippel, 2003). Thus, lead users are also likely to enjoy the design process in mass customization more than regular consumers do, increasing the process value of mass customization for them. Testing these relationships helps to understand for which types of consumers mass customization is most beneficial.

I investigate these relationships by conducting an empirical study with real consumers of customized sports apparel. So far, research on mass customization has focused strongly on the identification of value drivers under experimental conditions (e.g., cf. Franke et al., 2009, Franke and Schreier, 2010) or hypothetical surveys (e.g., cf. Merle et al., 2010, Hunt et al., 2013). However, validating these findings in reality is the crucial next step as it has been pointed out by Fogliatto et al. (2012: p.22): *"very few propositions were submitted to real-world validation, unbalancing the MC literature in terms of empirical and theoretical research."* To the best of my knowledge, there is no single study in mass customization so far that investigates and compares perceptions and behaviors of actual buyers and non-buyers of customized products. Consequently, this study raises the following three primary research questions:

1. Which consumer-specific attributes affect the perceived value of customization?
2. How do these effects differ between buyers and non-buyers of customized products?
3. How do product and process value as well as cognitive overload affect consumers' decision to purchase a customized product?

To address research question 1 and 2, I investigate four consumer-specific antecedents, which I hypothesize to influence the perceived product and process value

of customization as well as the level of cognitive overload. More precisely, I integrate two personality traits (maximization and regret anticipation), and two domain-specific attributes (product involvement and lead userness), into my research model. For research question 3, I test the joint influence of preference fit, process enjoyment, and cognitive overload on the purchase decision of consumers, thereby determining the extent to which these variables increase or diminish the likelihood of purchase.

Results indicate that maximizers benefit more from customization than satisficers and, going against the initial hypothesis, mass customization helps to reduce perceived overload for them. This effect could be primarily observed for the group of buyers. By contrast, consumers who experience a strong tendency towards regret feel significantly more overloaded by the amount of options. Regarding consumer-specific attributes, both lead userness as well as product involvement positively affect the value of customization, indicating that lead users and highly involved consumers benefit from customization. However, overload is not substantially reduced for them. This finding suggests that overload is a risk even for consumers with lead user characteristics or high involvement. The negative effect of overload on preference fit and process enjoyment is particularly evident for the group of non-buyers. Finally, the likelihood of purchase is influenced by all three constructs – preference fit, process enjoyment, and overload.

These findings have important theoretical and managerial implications. From a theoretical point of view I add to the discussion of the value of mass customization by identifying consumer-specific contingencies of the product and process value as well as cognitive overload. In addition, I contribute to the external validity of past findings in mass customization literature by empirically testing the effect of these three constructs on customers' purchase decision under real conditions. Moreover, I establish a first association between two research streams, mass customization and lead user theory, which may serve as a starting point for future research in this area. From a practical perspective, this study helps companies to identify the relevant customer segments that benefit most from mass customization, and allows differentiating their customers according to the perceived benefits of MC and its risk of cognitive overload. For companies that offer mass customization of sports apparel, my findings also provide indications of how the investigated value drivers jointly affect consumers' decision to purchase. Finally, the identified key differences between buyers and non-buyers of customized products can be weighed up as the basis for a customer-specific marketing strategy.

The remainder of this study is structured as follows. In section 6.2 I develop the relevant hypotheses and provide an overview of the proposed research model. In section 6.3 I describe method and measurement, followed by the process of data preparation in section 6.4. The analyses of the antecedents and the effect on consumers' decision to purchase as well as of the comparison between buyers and non-buyers are presented in section 6.5. Finally, I provide a summary and discussion of the results in section 6.6.

6.2 Theoretical background and hypotheses

6.2.1 The influence of personality traits on the value of mass customization

Literature has shown that people do not always choose rationally; instead two strategies of decision making behavior must be distinguished: maximizing and satisficing (Simon, 1955, Simon, 1956, Schwartz et al., 2002). Maximizers hardly settle for a solution they only regard as the second-best alternative (Schwartz et al., 2002). They rather continue searching for the optimum. Satisficers, by contrast, stop searching as soon as they find one solution that passes their threshold of acceptability (Schwartz et al., 2002). Drawing on this, maximizing consumers search for a product that they regard as optimal for themselves. In order to achieve this optimum they must be particularly interested in getting a product that best fits their individual preferences. This fit can be realized by mass customization because it enables consumers to get exactly what they want (Pine et al., 1995). Indeed, research has shown that customized products offer a better fit of consumers' preferences than standard products do (Franke et al., 2009). As maximizing consumers are likely to invest more time into getting the perfect product (Chowdhury, Ratneshwar, and Mohanty, 2009), I expect them to achieve a higher preference fit in customization compared to satisficing consumers. These consumers, by contrast, are likely to stop customization at the first configuration that matches their subjective threshold, which also restricts the increase in preference fit through customization. Thus, I expect maximization to positively affect consumers' preference fit in mass customization:

H_{1a}: Maximization increases the perceived preference fit in mass customization.

The increase in preference fit is also hypothesized to affect the second dimension of value in mass customization: process enjoyment. This value driver is in close relation to the perceived preference fit, as a high preference fit is supposed to create a positive mood that in turn positively affects the enjoyment of the design process (Franke and Schreier, 2010). Moreover, maximizing has been identified to positively correlate with individuals' need for cognition (Nenkov, Morrin, Ward, Schwartz, and Hulland, 2008). Need for cognition reflects a person's inclination to enjoy the process of thinking (Cacioppo and Petty, 1982). Consequently, I expect maximizers to also more strongly enjoy the design process in mass customization:

H_{1b}: Maximization increases the perceived process enjoyment in mass customization.

However, to gain a complete view on the real value of mass customization for maximizers, I need to incorporate the aforementioned risk of choice overload (Huffman and Kahn, 1998, Iyengar and Lepper, 2000). The basic principle of mass customization is to provide more variety to consumers and thus increase the number of available options that consumers can choose from. However, an increase in the number of options results in difficulties for maximizers (Schwartz et al., 2002: p. 1179): *"For the maximizer, added options pose problems. One cannot be sure that one is making the maximizing choice without examining all the alternatives."* This extensive inspection is likely to increase the risk of choice overload. Besides having high standards and extensively searching for alternatives, maximizers are conceptualized as having difficulties in making decisions (Schwartz et al., 2002, Nenkov et al., 2008, Rim, Turner, Betz, and Nygren, 2011). Mass customization substantially increases the number of decisions consumers have to make in order to achieve a final product configuration. Instead of simply deciding between a limited number of product alternatives, consumers need to decide on every single attribute. Hence, maximizers are likely to experience strong difficulties in deciding on their "best" product configuration, which further amplifies their cognitive overload in mass customization:

H_{1c}: Maximization increases consumers' cognitive overload in customization.

As well as maximization, I integrate a second personality trait into my study, consumers' anticipation of regret, which has been theorized to be an important determinant of people's decisions (Bell, 1982, Loomes and Sugden, 1982). As

maximizers have difficulties deciding on an option, considering their regret anticipation is highly relevant. Indeed, a vast amount of literature has highlighted that maximization is closely interlinked to a person's tendency to experience regret (cf. Schwartz et al., 2002, Zeelenberg and Pieters, 2007, Nenkov et al., 2008, Rim et al., 2011). Maximizers are strongly susceptible to regret because they brood over potentially foregone options that might be superior to the one they choose (Schwartz et al., 2002). Besides that, regret has been identified to play an important role in the context of mass customization, making consumers prefer standard products over customized ones (Syam et al., 2008). In order to gain a better view of the value of mass customization for maximizing consumers, I integrate consumers' general tendency towards regret into my study.

Regret comes along with feelings of disappointment or sorrow (Miller, Turnbull, and McFarland, 1990, Simonson, 1992, Gilovich and Medvec, 1995) and is thus also likely to negatively affect the perceived product and process value in mass customization. For consumers, regret has been shown to be particularly relevant when they have to choose from a large set of options (Sagi and Friedland, 2007). With more available options, utility decreases for consumers under regret (Irons and Hepburn, 2007). As this is the case in mass customization, I expect the negative effect of regret to be especially present when consumers customize their product. Regretful consumers continue to re-consider the foregone options (Schwartz et al., 2002). In mass customization, the number of omitted alternatives is much higher, which is likely to further amplify consumers' thoughts about what options could have been better. Therefore I expect consumers' general tendency towards regret to negatively affect the utility – that is, perceived preference fit, of their chosen configuration:

H_{2a}: Regret decreases the perceived preference fit in mass customization.

Similarly, regret can not only be experienced about the outcome but also about the decision process (Zeelenberg and Pieters, 2007). As mentioned before, regret is linked to negative emotions such as sorrow (Simonson, 1992). According to Desmeules (2002), regret reduces the joy that consumers experience in consumption due to frustration and disengagement from the process. The author theorizes that this effect emerges when consumers choose from a large variety. As this holds true for mass customization, regret is also likely to reduce the enjoyment of the design process in customization:

H_{2b}: Regret decreases the perceived process enjoyment in mass customization.

Moreover, I propose that consumers with a high tendency towards regret are more prone to be overloaded by the number of options in mass customization. Regretful individuals are afraid of negative consequences to occur after they make a decision (Bell, 1982). Therefore these persons tend to thoroughly evaluate all available options (Desmeules, 2002). However, when the number of options extensively increases, this evaluation starts to become mentally exhausting and difficult (Greifeneder et al., 2010). According to Desmeules (2002: p. 9), large variety can even result in consumers' *"inability to conduct all the evaluations [...] necessary to arrive at a choice."* In line with this statement, Gourville and Soman (2005) found that consumers tend towards brands that offer fewer choices when the comparison of products within the assortment of brands is difficult. They identified that this behavior is driven by consumers' anticipated regret. Moreover, regret reduces repurchase intentions (Tsiros and Mittal, 2000) or can even lead to choice deferral (Beattie, Baron, Hershey, and Spranca, 1994, White and Hoffrage, 2009). Drawing on these findings, large choice sets are particularly likely to imply decision difficulty for regretful consumers. At the same time, consumers' expectations rise when choice sets are large (Diehl and Poynor, 2010), making them more challenging to fulfill. This is likely to further intensify the difficulty to come to a decision for regretful consumers, as increased expectations are even harder to meet. Therefore, I expect consumers who possess a general tendency towards regret to feel more strongly overloaded by the variety that mass customization provides to them:

H_{2c}: Regret increases the cognitive overload in mass customization.

6.2.2 The influence of domain-specific attributes on the value of mass customization

Besides the personality traits mentioned above, domain-specific consumer attributes are expected to influence the perception of product and process value in customization. More precisely, consumers' level of engagement in the specific domain of the customized product is likely to play an important role in how consumers perceive the value of their customized product. According to von Hippel (2001: p. 255), *"users who do end up using a toolkit will often be 'lead users'."* The reason for this is that engaging in customization requires a certain amount of effort from consumers (Franke

and Schreier, 2010). They have to spend time on designing their product and they have to dedicate mental energy on the multitude of required decisions in customization. In order to compensate this effort, consumers either need to expect high benefits from the customized product or need to be strongly affectively attached to that product category. Expectation of high benefits is a central criterion for lead users (von Hippel, 1986, Lüthje and Herstatt, 2004, Franke, von Hippel, and Schreier, 2006). Thus, lead users are expected to be particularly interested in adjusting a solution to their needs, which is one of the key advantages of mass customization. Moreover, lead users have more use experience and knowledge than regular users have (Schreier and Prügl, 2008, Jeppesen and Laursen, 2009), indicating a stronger insight into their preferences. As preference insight is an important positive determinant of the preference fit that can be achieved through customization (Franke et al., 2009), lead users should particularly be able to profit from customization:

H_{3a}: Lead userness increases the perceived preference fit in mass customization.

Consumers' perception of the product and process value in mass customization is expected to be co-determined by a second antecedent: the level of product involvement. Product involvement describes the extent to which the product matters to a consumer (Zaichkowsky, 1985, Mittal, 1995) and is regarded as a distinct construct to lead userness in the literature. While lead userness predominantly determines consumers' cognitive attachment to a product, product involvement is meant to measure consumers' affective relatedness to that product (Schweisfurth and Raasch, 2015). Product involvement is also described as a motivational state (Bloch, 1982, Gordon, McKeage, and Fox, 1998), which further supports this differentiation. Thus, these two constructs can be regarded as two distinct factors.

Similarly to lead userness, I expect consumers' level of product involvement to positively affect the perceived preference fit in mass customization. Highly involved consumers are likely to deal more thoroughly with the customization process and to invest more resources into designing their own product as they are also highly interested in getting the perfect product (Franke et al., 2009). Thus, these consumers should be able to achieve a higher preference fit. Similarly, Valenzuela et al. (2009) suggested that consumers' familiarity with the product is an important determinant for the benefits of product customization. Furthermore, Franke et al. (2009) identified a positive relationship between product involvement and preference fit when they tested

consumers' willingness-to-pay in an experimental setting. In reality, an increase in preference fit is also supported by past research that identified highly involved consumers to be more satisfied with their product over time than consumers with low involvement (Richins and Bloch, 1991). Thus, I expect product involvement to also be positively associated with the perceived preference fit of a customized product in real purchase settings.

H_{4a}: Product involvement increases the perceived preference fit in mass customization.

Process enjoyment in customization is defined as *"positive affective reaction elicited by the process of self-designing the product"* (Franke and Schreier, 2010: p.1021). As stated before, product involvement is supposed to positively affect preference fit in mass customization. Franke and Schreier (2010) showed that preference fit positively affects the value consumers derive from the process enjoyment in mass customization. Hence, I also expect that a positive relationship between product involvement and perceived process enjoyment exists. Research on customer co-creation identified that consumers' motivation to participate in a co-creation project is also strongly driven by hedonic factors such as excitement, fun, and the joy of cognitive stimulation, in addition to the mere need to improve the product (Füller, Bartl, Ernst, and Mühlbacher, 2006, Füller, Jawecki, and Mühlbacher, 2007, Nambisan and Baron, 2009). Similarly, users who voluntarily participate in an open innovation project also receive process-related benefits such as enjoyment from their engagement (Lakhani and von Hippel, 2003, Baldwin and von Hippel, 2011, Raasch and von Hippel, 2013). These participants are expected to be highly involved or to have lead user characteristics. For example, Nishikawa, Schreier, and Ogawa (2013) found that winning participants of user innovation contests had a high product category involvement and showed lead user characteristics. Therefore, I expect lead users and highly involved consumers to enjoy the design process in mass customization to a greater extent than regular consumers do:

H_{3b}: Lead userness increases the perceived process enjoyment in mass customization.

H_{4b}: Product involvement increases the perceived process enjoyment in mass customization.

Lead users have been identified to possess increased use experience and knowledge concerning the product (Schreier and Prügl, 2008). Thus, they are better

informed about the different properties of a product and are more knowledgeable about the product. This is also supported by Schreier, Oberhauser, and Prügl (2007) who found kite surfers with leading edge status to perceive the complexity of their bow kite as significantly lower. In an experiment about car configuration, Dabic (2006) identified that consumers' product class involvement reduces the effort of seeking information. A higher level of knowledge and expertise is likely to reduce the risk of cognitive overload for them when customizing a product. This is supported by findings from Matzler et al. (2011) who identified that knowledge about the product significantly reduces confusion in mass customization. Moreover, Dellaert and Stremersch (2005) found that a high level of expertise reduces the perceived complexity in mass customization. In addition, Bharadwaj et al. (2009) showed that consumers who have a higher level of expertise in a product category have a stronger preference for customized systems of that category compared to novices, indicating that experienced consumers are more capable of dealing with the complexity mass customization brings about. Based on these argumentations, I expect lead users and highly involved consumers to experience less cognitive overload in mass customization:

H_{3c}: Lead userness decreases the cognitive overload in mass customization.

H_{4c}: Product involvement decreases the cognitive overload in mass customization.

6.2.3 The impact of cognitive overload on preference fit and process enjoyment

In the area of consumer research, a controversial discussion has emerged around whether consumers can feel overloaded when confronted with a large variety of options. While several studies supported the existence of *"choice overload"* (Iyengar and Lepper, 2000: p. 996) with a negative influence on consumer satisfaction, purchase likelihood, or sales volume (e.g., see Iyengar and Lepper, 2000, Boatwright and Nunes, 2001, Diehl and Poynor, 2010, Kuksov and Villas-Boas, 2010), other scholars were not able to replicate these findings or even found contrary effects (e.g., see Borle et al., 2005, Berger et al., 2007, Scheibehenne, 2009). In a meta-analysis of 50 studies, Scheibehenne et al. (2010) found a mean effect size of choice overload of nearly zero. Thus, the effect of overload remains ambiguous.

For mass customization, elucidating this ambiguity is of particular relevance due to the increased number of choices consumers are required to make. Findings from past

research on *mass confusion* (Teresko, 1994, Huffman and Kahn, 1998) provide some support for the existence of choice overload in mass customization. For example, Levav, Heitmann, Herrmann, and Iyengar (2010) identified that mental depletion is likely to occur in product customization after a certain amount of choices have been made by consumers. Dellaert and Stremersch (2005) found a negative effect of perceived complexity on the utility of a customized product. Drawing on that, overloaded consumers are likely to no longer be able to choose those attributes that best suit their preferences. Thus, I hypothesize that overloaded consumers in mass customization have a reduced preference fit:

H_5: Cognitive overload decreases preference fit in customization.

Likewise, choice overload is likely to diminish process enjoyment in mass customization. According to Desmeules (2002), extending variety above a certain threshold negatively affects the joy of the consumption experience, as consumers become frustrated and disengaged from the process. I expect this threshold to depend on consumers' individual perceptions of choice overload. Hence, a negative relationship between choice overload and process enjoyment is likely to exist. Further support for this hypothesis is provided by Matzler et al. (2011) who identified that poor information about the product on mass customization websites negatively affects the enjoyment consumers relate to customization. Therefore, I propose:

H_6: Cognitive overload decreases process enjoyment in customization.

6.2.4 The effect of preference fit, process enjoyment, and overload on consumers' purchase decision

In addition to assessing the network of consumer-specific antecedents in the value of mass customization, this study aims to test the interplay of choice overload, product and process value on consumers' decision to buy the customized product. Both preference fit and process enjoyment in customization have been identified to significantly increase consumers' willingness-to-pay (Franke et al., 2009, Franke and Schreier, 2010). In reality, when prices are set by a company, this increased willingness-to-pay is likely to result in a higher likelihood for consumers to purchase their customized product. This is supported by Simonson (2005), who theorized that the likelihood of purchasing a customized offer depends on the perceived fit and

attractiveness. Thus, I expect consumers' perceived preference fit and process enjoyment to positively influence the odds of purchasing the customized product:

H_7: Preference fit increases the likelihood to purchase the customized product.

H_8: Process enjoyment increases the likelihood to purchase the customized product.

By contrast, cognitive overload is likely to reduce the likelihood to purchase in mass customization. As pointed out before, choice overload has been demonstrated to lead to choice deferral (Iyengar and Lepper, 2000). Likewise, Valenzuela et al. (2009) found a lower likelihood to purchase the customized good when consumers customized by alternatives instead of attributes. As participants in their experiment also perceived the by-alternative customization as being more complex, this finding indicates that complexity reduces purchase likelihood. As complexity is closely associated with the effect of having too much choice (Greifeneder et al., 2010), cognitive overload is also likely to reduce the likelihood of purchase in customization. Moreover, perceived overload reduces satisfaction with the customized product (Matzler et al., 2011). Therefore, I propose that cognitive overload reduces the likelihood to purchase the customized product:

H_9: Cognitive overload decreases the odds of purchasing the customized good.

6.2.5 Summary of the research model

Figure 28 summarizes the hypotheses presented above and provides an overview of the research model. The model consists of four antecedents, the two personality traits maximization and regret anticipation and the two domain-specific attributes lead userness and product involvement, which are hypothesized to affect the perceived preference fit, the process enjoyment, and cognitive overload. In a second layer, these three factors are expected to influence consumers' decision to purchase.

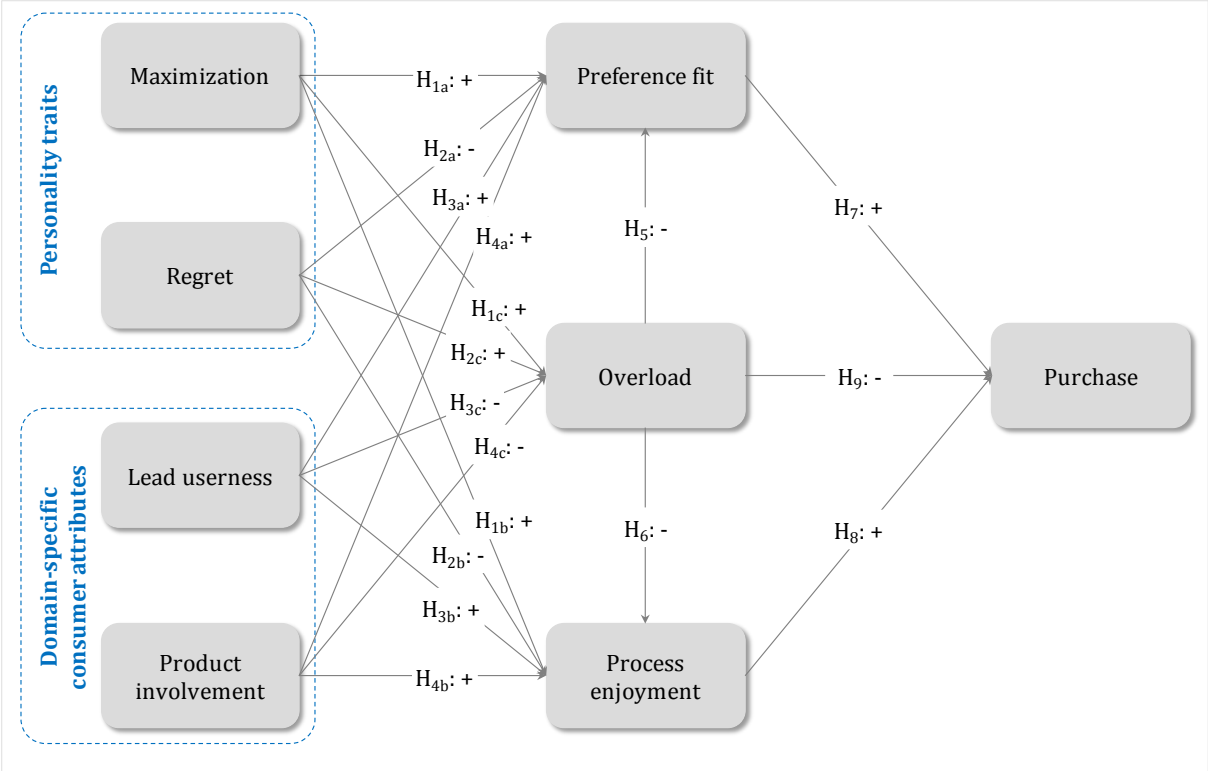


Figure 28: Full research model of part III

6.3 Method

6.3.1 Data collection

This research was conducted in collaboration with a large global sporting goods brand. The company agreed to survey their customers on their mass customization system. A link to the survey was sent out by the company via e-mail to customers who had registered themselves on the company's official website for customized goods. The survey was launched on 1st of December 2014 and remained open for 14 days. 92.9% of the responses were collected in the first two days. In total, 1,046 completed questionnaires were collected. As the customers were contacted by the company and the company did not provide details on the total number of contacts, the exact response rate could not be calculated. Based on the information I received, the response rate was about 2-3%, which is quite low. However, web-based surveys have been shown to yield substantially lower response rates compared to other modes of data collection (Manfreda, Bosnjak, Berzelak, Haas, and Vehovar, 2008, Sauermann and Roach, 2013)

and have strongly decreased in the past decades (Sheehan, 2001) due to the decreasing attention consumers pay to mass marketing e-mails. Nevertheless, as stated by Krosnick (1999: p. 540), *"surveys with very low response rates can be more accurate than surveys with much higher response rates."* Based on this argumentation and under consideration of the extensive number of control variables that are included into the analysis, this low response rate is not assumed to be a serious threat to the reliability of the data obtained.

The questionnaire was developed with the online platform SurveyMonkey[21] and consisted of three main parts (see Figure 29). As consumers from France, Germany, the United Kingdom, and the Netherlands were contacted, the questionnaire had to be translated from English into German and French before the survey was launched. To ensure accuracy of the translation, back-translation into English was employed (Brislin, 1970, Miracle and Bang, 2002).

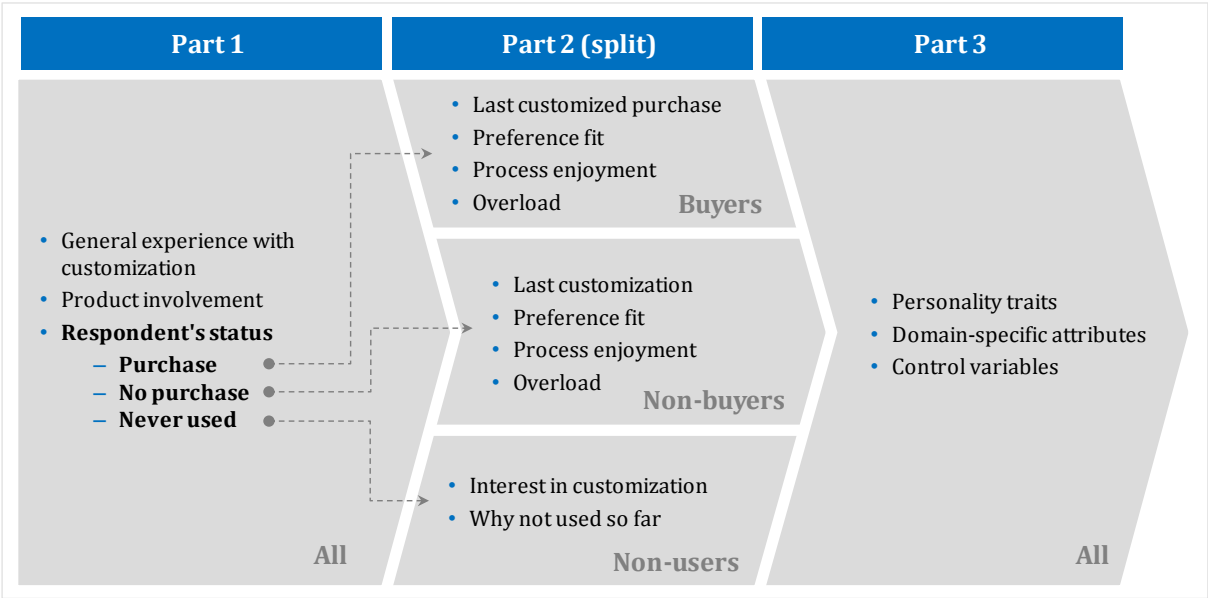


Figure 29: Survey structure

6.3.2 Measurement

I utilize established scales for all variables in the study in order to attain a high level of validity and reliability. All items are measured on 7-point Likert scales. Table 24 provides an overview of the operationalization of the constructs.

[21] https://de.surveymonkey.com

Dependent variables

Preference fit and process enjoyment. To assess the extent of perceived preference fit and process enjoyment, I utilize the scale from Merle et al. (2010), which measures each of the constructs with three items. The authors developed a specific scale to measure the different dimensions of perceived value in mass customization. As they tested reliability and validity of their scale in the same product category as this study investigates (sports shoes), it is particularly suitable. As mentioned above, in this study I focus on the two value drivers preference fit and process enjoyment.

Cognitive overload. For cognitive overload, I include the three-item scale from Matzler et al. (2011) that measures the extent to which consumers feel overloaded by the number of options provided. This scale was specifically developed to measure the overload of consumers in mass customization and is therefore appropriate for this study. It also demonstrated good psychometric properties in the past (cf. Matzler et al., 2011). Moreover, this scale is similar to the overload confusion scale from Walsh et al. (2007) that has already been applied in part II of the thesis.

Purchase. The dependent variable purchase is a binary variable which separates the sample into two groups: buyers and non-buyers. Separation is done by asking the participants whether they bought their customized product (0 = no; 1 = yes).

Independent variables

Maximization. The tendency of a consumer towards maximization is measured by the six-item scale from Nenkov et al. (2008). This scale is a short version of the original maximizing versus satisficing scale from Schwartz et al. (2002). Psychometric properties as well as nomological validity are similar to the original 13-item scale (cf. Nenkov et al., 2008). This scale still comprises all of the three original sub-dimensions of maximization – that is, alternative search, decision difficulty, and high standards (Schwartz et al., 2002). By contrast, the maximization tendency scale that has been developed by Highhouse, Diab, and Gillespie (2008) only focuses on measuring the high standards component. However, subsequent research criticized that this scale does not representatively measure the real difference between maximizers and satisficers as it neglects the other two dimensions, which are indeed highly relevant in terms of Schwartz's original definition of maximizing vs. satisficing (Rim et al., 2011). As this scale has also been recently applied to consumer research (cf. Jingjing and Roese, 2014), I decided to stick to the original scale that covers all of the three sub-dimensions.

Regret. To assess the extent to which consumers generally regret their decisions, I apply the five-item scale from Schwartz et al. (2002). This scale is described by the authors to be independent from the choice situation and therefore captures participants' general proclivity towards regret. It needs to be differentiated from scales that assess a person's situational regret about a specific purchase decision. This differentiation is important for my study as I hypothesize a relationship between the general personality trait of regret and the perceived value of mass customization. The regret scale from Schwartz is well-received in research on psychology and decision making behavior (cf. Appelt, Milch, Handgraaf, and Weber, 2011) and has also recently been applied in the context of choice overload (cf. Reed, DiGennaro Reed, Chok, and Brozyna, 2011), which provides further support for the appropriateness of this scale for my study.

Lead userness. I measure respondents' lead userness characteristics by applying the three-item lead user scale from Jeppesen and Frederiksen (2006). This scale is based on the leading edge user construct from Morrison, Roberts, and Von Hippel (2000). Among the existing scales on lead userness, I regard this scale as being most suitable in identifying lead users among consumers of customized sports apparel, for two reasons. Firstly, compared to other scales that measure lead user characteristics (Franke et al., 2006), this scale is uni-dimensional, which is in line with recent measurements of lead users (Schreier and Prügl, 2008, Schweisfurth and Raasch, 2015). Secondly, as my study concerns lead users of sports apparel, the formulation of the items appeared to be more suitable than those of other lead user scales, which include questions about specific techniques acquired in the respective sports category (Franke et al., 2006). These items would have been difficult to apply to sports apparel in general.

Product involvement. To measure consumers' level of product involvement, I utilize the well-established scale from Zaichkowsky (1985), which consists of six semantic differential pairs. This scale has already been applied to research on mass customization (Franke et al., 2009) and was also used in part II of this dissertation.

Table 24: Operationalization of constructs

Construct	Source	Code	Indicator
Preference fit	Merle et al., 2010	FIT1	This product design is exactly what I had hoped for.
		FIT2	I could create the product that provided the best fit to what I was looking for.
		FIT3	I could create the product I really wanted to have.
Process enjoyment	Merle et al., 2010	ENJ1	It was fun to customize this product.
		ENJ2	I really enjoyed creating this product.
		ENJ3	Customizing this product was a real pleasure.
Overload	Matzler et al., 2011	OVL1	It was difficult to find a satisfactory design for my product due to the amount of options.
		OVL2	The huge range of options made it difficult to maintain an overview.
		OVL3	It was very hard to decide on a product design due to the various possibilities from which one can choose.
Maximi-zation	Nenkov et al., 2008; Schwartz et al., 2002	MAX1	When I'm in the car listening to the radio, I often check other stations to see if something better is playing, even if I'm relatively satisfied with what I'm listening to.
		MAX2	No matter how satisfied I am with my job, it's only right for me to be on the lookout for better opportunities.
		MAX3	I often find it difficult to shop for a gift for a friend.
		MAX4	Renting movies is really difficult. I'm always struggling to pick the best one.
		MAX5	No matter what I do, I have the highest standards for myself.
		MAX6	I never settle for second best.
Regret	Schwartz et al., 2002	REG1	Whenever I make a choice, I'm curious about what would have happened if I had chosen differently.
		REG2	Whenever I make a choice, I try to get information about how the other alternatives turned out.
		REG3	Once I make a decision, I don't look back. (R)
		REG4	If I make a choice and it turns out well, I still feel like something of a failure if I find out that another choice would have turned out better.
		REG5	When I think about how I'm doing in life, I often assess opportunities I have passed up.
Lead userness	Jeppesen & Frederiksen, 2006	LU1	I usually find out about new sports goods earlier than others.
		LU2	I have benefited significantly by early adoption and use of new sports goods.
		LU3	I have tested prototype versions of new sports goods for manufacturers.
Product involvement	Zaichkowsky, 1985	PI1	important
		PI2	matter to me
		PI3	useless (R)
		PI4	not needed (R)
		PI5	essential
		PI6	boring (R)

(R): indicator reversed scored

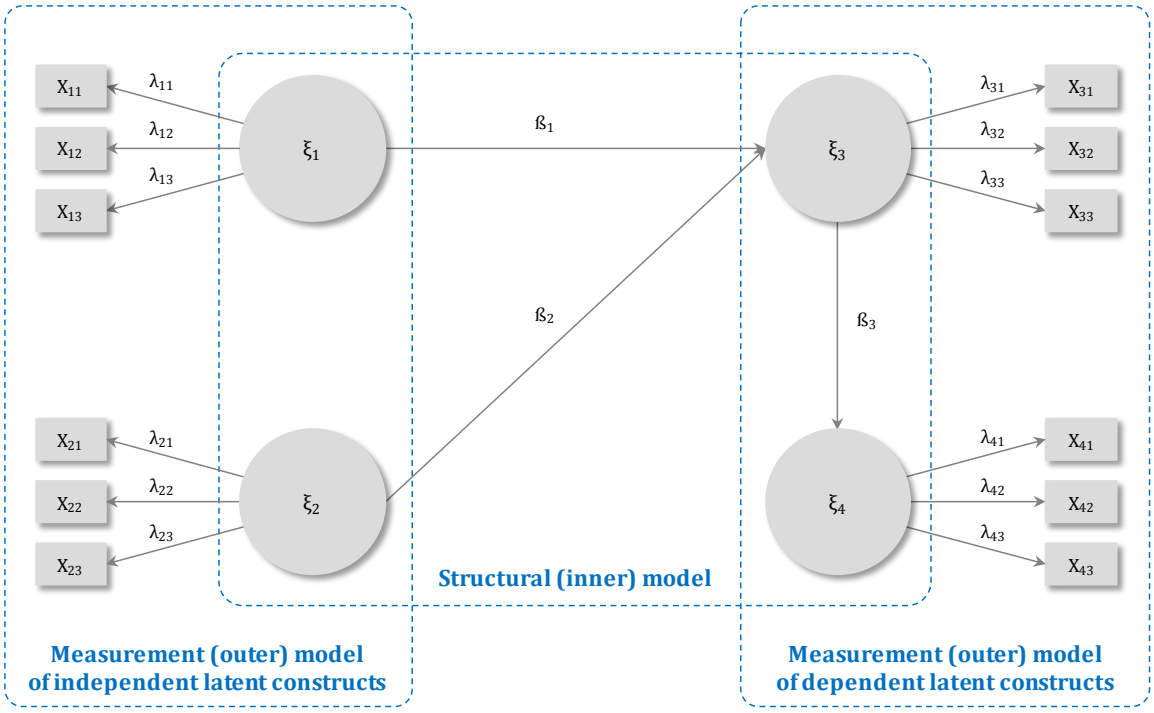
Control variables

As the questionnaire was sent out to a large and diverse group of customers, I include several control variables into the analysis. Besides age, gender (0 = male; 1 = female), and educational degree (1 = none; 2 = less than high school; 3 = High school (A-levels); 4 = Bachelor's degree or equivalent degree; 5 = Master's degree or equivalent or higher degree), I additionally control for the questionnaire language, as the survey was distributed in three different versions (English, French, and German). This is done by introducing two binary dummy variables for the three options. Lastly, I also include the date of customization as another control variable (1 = 2012 or earlier, 2 = 1st quarter 2013 to 8 = 4th quarter 2014) to control for the influence of the point in time at which customization took place.

6.3.3 Structural equation modeling

The application of structural equation modeling (SEM) has strongly increased across different research disciplines in the past decades (Hershberger, 2003, Kline, 2005, Reinecke, 2014) and is seen as a second-generation data analysis technique (Bagozzi and Fornell, 1982). I decided to apply SEM for two main reasons: Firstly, it can be used to test complex theoretical models with causal relationships simultaneously between several dependent and independent variables by ensuring a more accurate analysis of the hypothesized research model than first generation techniques (Gefen, Straub, and Boudreau, 2000). Secondly, SEM has the possibility to consider latent unobserved variables in order to control for common method variance (Fornell and Larcker, 1981). As mentioned in chapter 3.2.2, controlling for common method variance is essential in analyses that exclusively use survey data, which is the case for this study.

Structural equation models consist of two models: the measurement (outer) model and the structural (inner) model (Hair, Hult, Ringle, and Sarstedt, 2014). The measurement model specifies the relationships (λ_n) between the observed indicators (X_n) and the latent constructs (ξ_n) whereas the structural model describes the relationships (β_n) between the dependent and independent constructs (Hair et al., 2014). Latent constructs are theoretical variables that cannot be directly measured and are therefore represented by indicators (Eggert and Fassott, 2003). Indicators are directly measured items from the questionnaire that contain the actual data. Figure 30 provides an overview of the key elements of SEM.



Source: adapted from Hair et al., 2014; Henseler, 2005

Figure 30: Key elements of a structural equation model

Constructs can either be of reflective or formative nature (cf. Edwards and Bagozzi, 2000, Eggert and Fassott, 2003, Jarvis, MacKenzie, and Podsakoff, 2003). In this study, only reflective constructs are used. The key difference between both types is the causal relationship between the latent construct and the indicators (Henseler, 2005). Each indicator of a formative construct describes a part of this latent construct and thus does not necessarily need to be correlated with the other formative indicators. Together they *form* the latent construct. In contrast, the indicators of a reflective construct should all *reflect* the same latent variable and therefore also need to be highly correlated. This differentiation is important for the analysis of the measurement model that I perform in chapter 6.5.1.

Two main analytical techniques exist to assess structural equation models (e.g., see Gefen et al., 2000, Lowry and Gaskin, 2014): covariance analysis (e.g. LISREL or AMOS) and partial least squares (PLS). In this study I employ PLS as the method of analysis for two reasons:

Firstly, the emphasis of this study is on prediction and not on confirmation of an existing research model, which favors the application of PLS (Reinartz, Haenlein, and Henseler, 2009). As mentioned in chapter 6.1, this study tests the influence of different

exogenous antecedents (personality traits as well as domain-specific consumer attributes) on consumers' perception of the central drivers that affect the value of mass customization. Thus, the objective is to predict which of these antecedents affect which value drivers and what types of consumers particularly benefit from mass customization. As covariance-based SEM should only be used to test well-established theories due to the difficulty of clear causality (Lowry and Gaskin, 2014), PLS is the appropriate method for this study.

Secondly, although simulations show that covariance-based methods are also quite robust against non-normal distribution of data (Reinartz et al., 2009), the use of PLS is recommended if data is not normally distributed because it prevents any estimation bias (Hair, Ringle, and Sarstedt, 2011). As some of the variables show a non-normal data distribution (see section 6.4.4), using partial least squares modeling is the conservative and most appropriate approach for this case.

6.4 Data preparation and description of sample

In this section of the study, I explain the necessary steps taken to receive a reliable sample, and present some descriptive statistics of this sample. As some of the questions were optional, I begin by imputing this missing data. Next, I screen the sample in order to identify and exclude data sets that may reduce the reliability of the sample. Afterwards I test for differences in this sample with regards to the control variables and I assess the distribution of the dependent variables. Finally, I provide some exploratory findings from the sample, which are separate from the actual analysis but contribute to understanding consumers' perceptions of mass customization.

6.4.1 Imputing missing data

As data for two control variables is incomplete (Table 25), I use the expectation maximization (EM) method to impute the missing values. The EM method determines missing values by iteratively computing maximum likelihood estimates (Dempster, Laird, and Rubin, 1977). It is seen as a standard and reliable method to complete missing data sets (McLachlan and Krishnan, 2007). However, the algorithm is not applicable for binary variables such as gender. As some of the data sets of my survey contain missing values in the binary variable gender, I exclude those from all analyses.

Table 25: Missing data of main variables

				Missing	
	Complete datasets	**Mean**	**SD**	**Count**	**Percent**
Gender	1041	0.29	-	5	0.5 %
Age	1028	29.63	10.28	18	1.7 %
Educational degree	996	3.49	0.88	50	4.8 %

Total n = 1,046

The method requires data to be missing completely at random (McLachlan and Krishnan, 2007). To test this precondition, Little's MCAR test is conducted (Little, 1988). If test results are insignificant, data can be assumed to be missing at random. As the MCAR test is in fact insignificant ($\chi^2 = 1.312$; $p = .519$), the assumption of randomness can be regarded as true.

6.4.2 Deriving a reliable sample

Screening the data and excluding data sets that may diminish reliability of the results is crucial prior to analysis. Leaving out this step is seen as *"one of the most common mistakes in applying SEM"* (Baumgartner and Homburg, 1996: p. 147). Therefore, I conduct a series of reliability checks. As mentioned before, I exclude data sets with missing values in gender (5 respondents, 0.5%). Furthermore, I asked participants in the beginning of the questionnaire whether they have ever used the configurator of the company. As non-users followed a different questionnaire structure after this question (see section 6.3.1) and thus did not provide data to the actual research model, I must also exclude them from the sample. In total, 110 respondents (10.5%) stated that they have never used the configurator und thus are removed from the sample. In addition, users of the tool were asked about the point in time at which they customized their product on the company's website. 81 (7.7%) respondents customized their product in 2012 or earlier (≥ 2 years before the survey took place). However, this study aims to investigate determinants of preference fit and process enjoyment as well as their influence on the purchase decision. If the customization activity took place too long ago, respondents' actual perception may have altered over time. To ensure a conservative and reliable approach in data analysis, these respondents are also excluded from the analysis.

For the remaining sample of 850 participants I conduct two final quality checks in order to exclude any respondents that may not have thoroughly answered the questionnaire. First, I review the time participants spent on the questionnaire. As the median is 14.53 minutes, I exclude respondents who took less than 7.26 minutes (50% of the median) to complete the questionnaire. This duration is assumed to be the minimum time to thoroughly read and understand the questionnaire. This procedure reduces the sample size by 21 (2.0%). Second, I identify any patterns in responses by investigating the standard deviations in responses. A standard deviation of SD < 0.5 indicates a very low variance in responses between the different items. As some of the items have been reversed (see section 6.3.2), such a pattern indicates low engagement of participants. In total, 28 respondents (2.7 %) show this kind of pattern. Thus, I exclude those answers from all subsequent analyses. The remaining final sample consists of 801 responses (see Figure 31 for an overview).

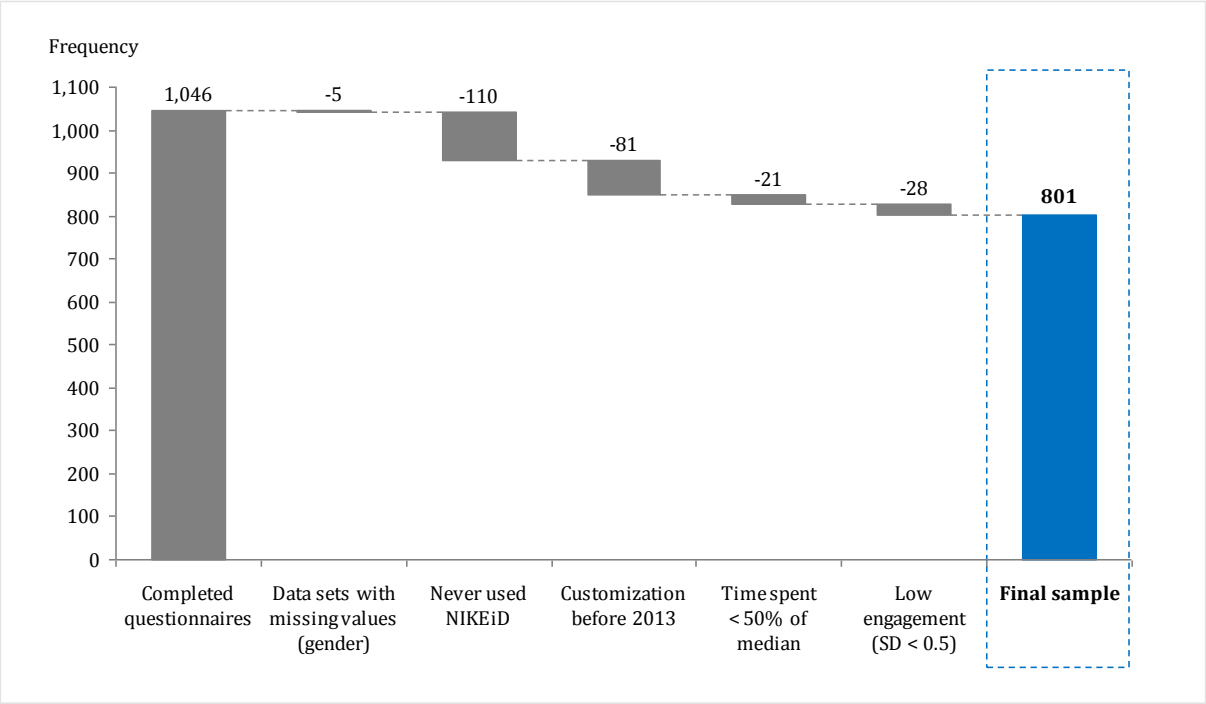


Figure 31: Derivation of final sample

6.4.3 Testing for differences in the control variables

The sample consists of two groups of consumers, buyers and non-buyers. In total, 56.4% of the respondents are buyers. 27.2% of the respondents are female; participants' average age is 28.6 years and their average educational degree is 3.5 (see Table 26 for an

overview). The majority of respondents (79.9%) customized their product recently (between July and December 2014; see Figure 32).

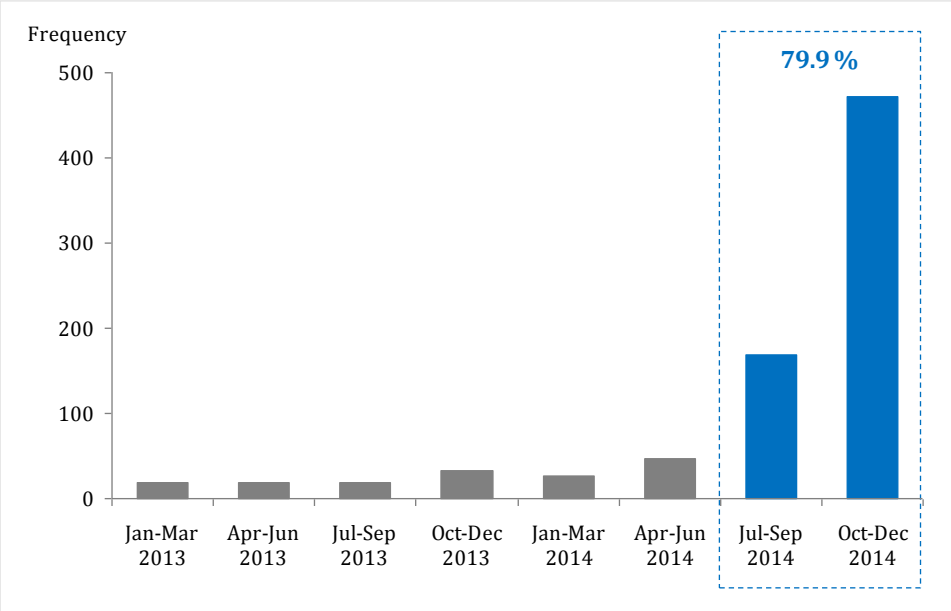


Figure 32: Temporal distribution of customizations

As mentioned earlier, the survey was distributed to registered customers of the company in three different languages (English, French, and German). Overall, 286 responses were collected in English (35.7%), 264 in French (33.0%), and 251 in German (31.3%). As some minor differences in the share of buyers and non-buyers as well as female and male customers per questionnaire version can be identified (see Figure 33), I test whether these differences are significant. However, the share of buyers and non-buyers does not substantially differ between countries ($\chi^2 = 3.275$; n. s.). Similarly, no significant differences in gender ($\chi^2 = 0.963$; n. s.) can be identified. Furthermore, I conduct t-tests to assess whether the mean values of any of the other control variables significantly differs between the three countries. Test results are insignificant for all except for the mean educational degree, which is significantly different between German and French customers ($t = 3.188$; $p < .01$). Yet, as this is the only identified difference, I assume the three samples to have sufficiently comparable characteristics regarding the control variables. However, I include language as well as educational degree as additional control variables into my analysis in order to account for this difference.

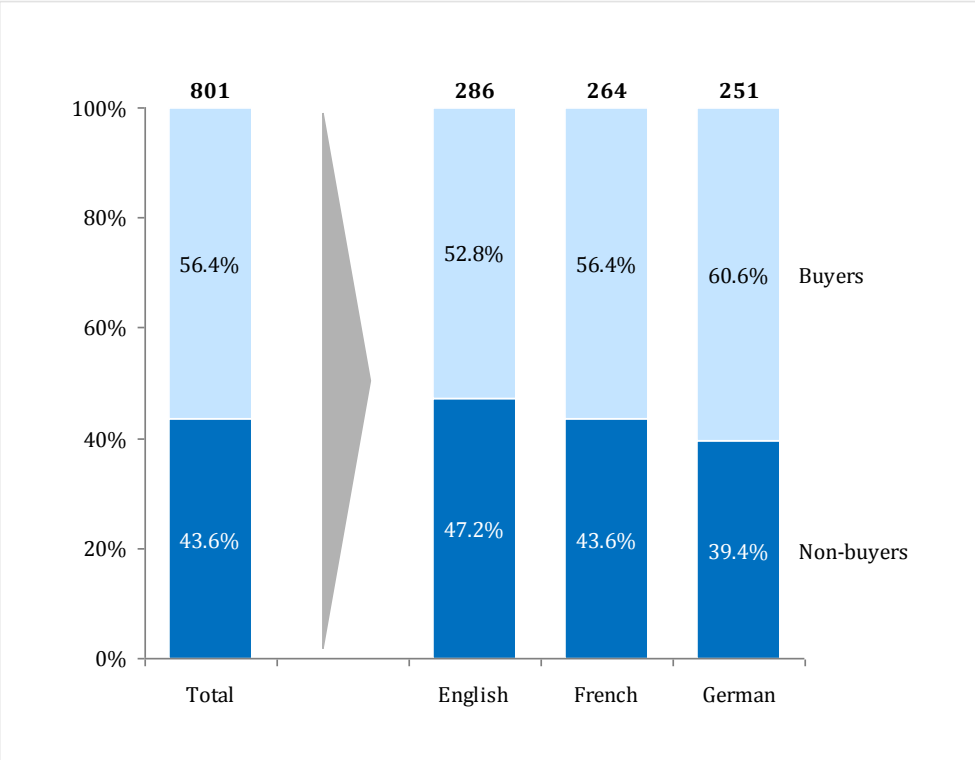


Figure 33: Share of buyers and non-buyers in the sample

Table 26: Descriptive statistics of sample

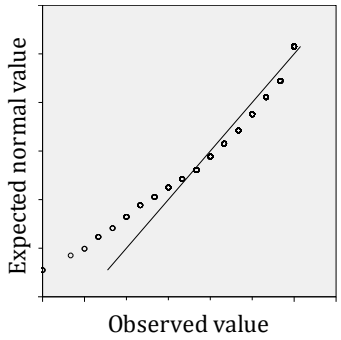
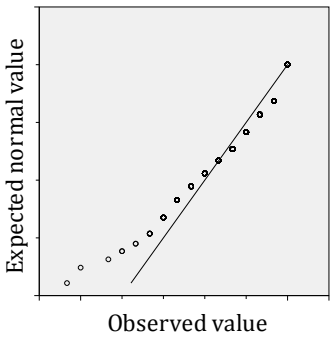
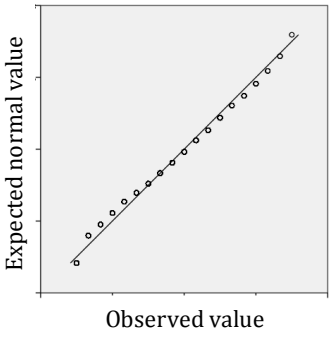
		Questionnaire language		
	Total	**English**	**French**	**German**
n	801	286	264	251
Buyers	452	151	149	152
Non-buyers	349	135	115	99
Percentage of females	27.2%	25.2%	28.0%	28.7%
Mean age (SD)	28.60 (9.75)	28.92 (10.65)	27.86 (8.82)	29.01 (9.60)
Mean educational degree	3.47 (0.86)	3.55 (0.88)	3.55 (0.64)	3.31 (0.99)
Date of customization	8.0 (1.71)	7.96 (1.71)	8.11 (1.62)	7.93 (1.81)

6.4.4 Analyzing the distribution of the dependent variables

Finally, data distribution needs to be assessed (Baumgartner and Homburg, 1996). As the model aims to explain the variance of the three variables preference fit, process

enjoyment, and overload, I inspect the distribution of these three dependent variables. Table 27 summarizes the analysis of normality for these three variables. As it can be seen by visual inspection of the q-q plots, data seems to be non-normally distributed particularly for preference fit and process enjoyment. Skewness and kurtosis values for these two variables also exceed the acceptable range of -1 and +1 (Breakwell et al., 2006). In addition, results of Kolmogorov-Smirnov tests are highly significant ($p < .001$) for all three variables, indicating non-normal data distribution. As mentioned in section 6.3.3, this finding is another important reason to choose PLS-SEM over covariance-based SEM as a preferred method of analysis for this study (Hair et al., 2011).

Table 27: Analysis of normality for dependent variables

	Preference fit	**Process enjoyment**	**Overload**
Normal proba-bility plot			
Mean	5.84	6.14	2.95
SD	1.15	0.92	1.42
Skewness	-1.22	-1.14	0.37
Std. Error	0.09	0.09	0.09
Kurtosis	1.49	1.14	-0.65
Std. Error	0.17	0.17	0.17

n = 801

6.4.5 Exploratory findings from the survey

Besides variables from the actual research model, the survey contained some additional questions for buyers and non-buyers in order to acquire a greater insight into their decision to buy (or not to buy) the customized product (see appendix C for details on the questionnaire). In this section I briefly explain these findings as they are also

relevant for the discussion of the results in section 6.6. As some of the questions asked were tailored to a specific group, the following analyses are based on the differentiation between buyers, non-buyers, and non-users of the company's mass customization system.

First, I assess what is most important to consumers in customization and review differences between the three groups. Respondents were able to choose between three different answers: (1) low price, (2) high number of options for customization, and (3) quick delivery time. These three elements were chosen in collaboration with the company, as these criteria also represent the triangle of trade-offs from a company's perspective: the more options the firm offers, the higher the price must be and the longer the delivery time is, as complexity increases with the number of options. As apparent in Figure 34, considerable differences between buyers and the other two groups exist: Whereas 65.5% of the buyers regard the number of customization options as most important, this is most important for 41.5% of the non-buyers and for 36.4% of the non-users. For them, 52.7% (56.4% in case of non-users) state low price as most important. In contrast, only 23.9% of the buyers rate price as the most important criterion. Quick delivery time is relatively unimportant for all three groups (7.3% for non-users, 5.7% for non-buyers, and 10.6% for buyers). These findings indicate that the number of options plays an important role in customization, particularly for buyers.

As stated by Franke and Hader (2014), identifying the reasons that prevented consumers from using customization toolkits would be extremely important and has not been investigated so far. Thus, I asked non-users (n = 110) for the reason why they have not used the company's customization program so far (Figure 35, left side). Respondents were able to select multiple answers. The majority of the respondents either indicate the price (53.6%) or missing awareness of the company's customization system (37.3%) as reasons. Interestingly, 20.0% of the respondents felt unsure about their own design skills. This finding is important as it highlights another potential drawback of mass customization that has not been discussed in past research: consumers' missing confidence in their own design skills. By contrast, only a small amount of participants find customization too complicated (5.5%) or uninteresting (4.5%), indicating that most consumers are not put off customization by the effort they are required to invest.

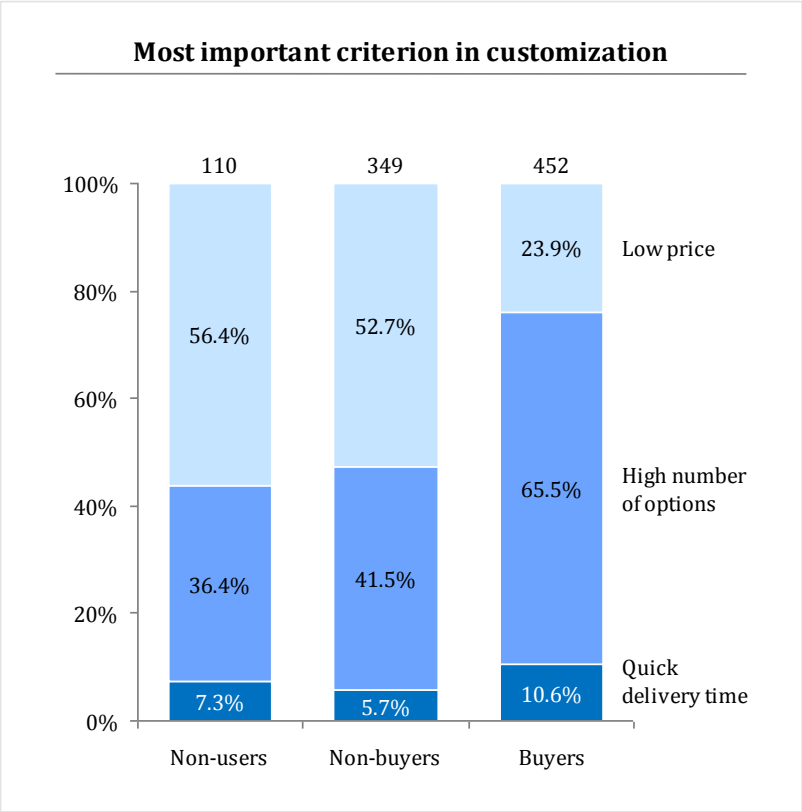


Figure 34: Stated preferences of consumers

Finally, I asked non-buyers for the main reasons why they did not purchase their customized product (Figure 35, right side). Again multiple answers were possible. Similarly to non-users, price was the most frequently stated reason (77.7%). However, the second most important reason for consumers that prevented them from purchasing their customized product was the limited amount of options (26.1%). Non-buyers also stated to be unsure about their self-designed product (25.2%) as the third most important reason not to buy the customized product.

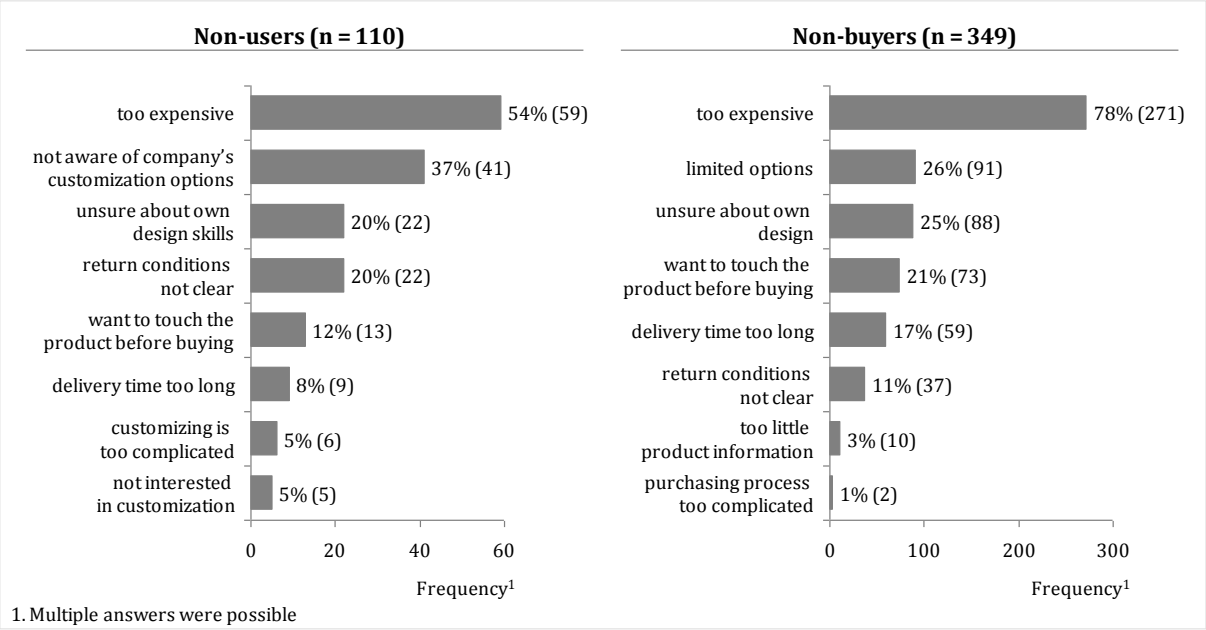


Figure 35: Reasons for non-usage (left) and non-purchase (right) in mass customization

These results provide some background information on the perceptions and needs of buyers and non-buyers of customized products. I incorporate these findings together with the results from the actual analysis into the discussion section of this study.

6.5 Main analysis

The analysis of the proposed research model is divided into two parts as shown in Figure 36. I test the first part – the effect of consumer-specific antecedents on the value of mass customization – via structural equation modeling in SmartPLS (Version 2.0.M3). The second part of the model – the value drivers' influence on consumers' purchase decision – needs to be separately assessed, as the dependent variable is binary (buyers versus non-buyers). Including this type of variable in PLS models leads to measurement errors (Hair, Sarstedt, Ringle, and Mena, 2012). Thus, I use a hierarchical logistic regression to analyze the right part of the model.

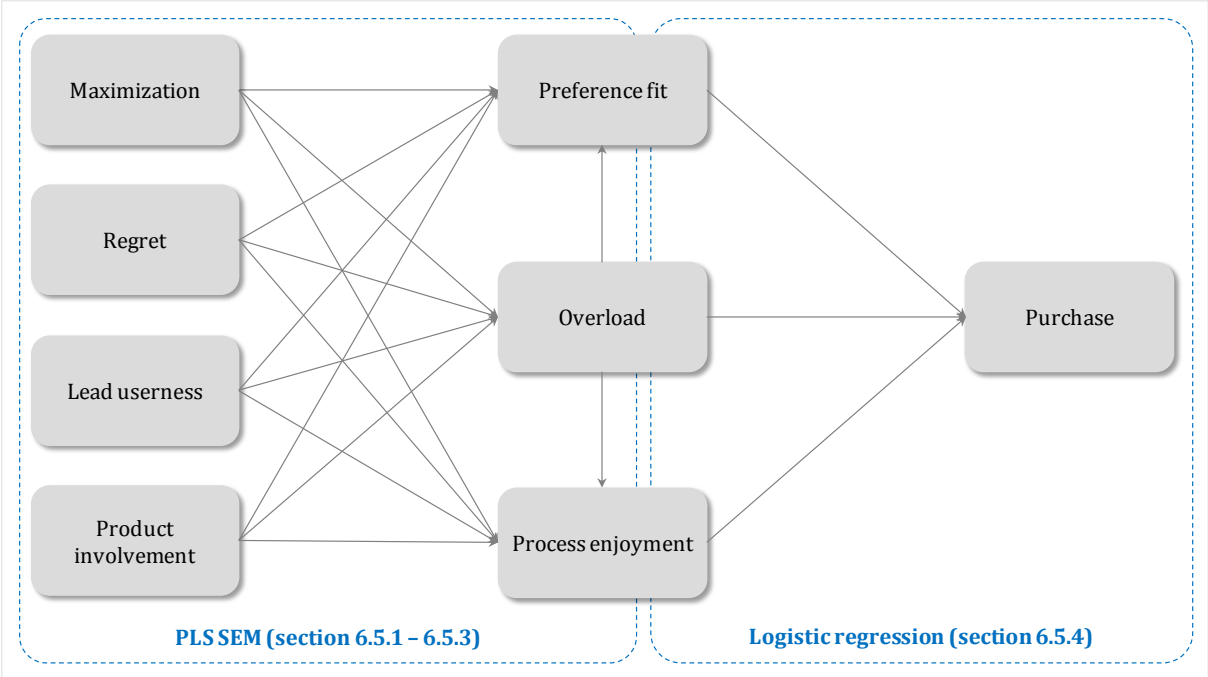


Figure 36: Strategy of analysis for the proposed research model

6.5.1 Measurement model

The assessment of a structural equation model in PLS starts with an analysis of the outer part of the model, the measurement model. As only reflective constructs have been applied, the assessment of the measurement model comprises the following analyses (Hair et al., 2011):

- Indicator reliability
- Internal consistency reliability
- Convergent validity
- Discriminant validity

To determine indicator reliability, each indicator must be tested for its loading on the related construct as well as the significance of this loading. According to Hair et al. (2011), indicators with loadings below the threshold value of 0.40 need to be removed from reflective scales. As six of the measured indicators fall into this category (Table 28), they are eliminated from the measurement model. If the indicator reliability is between 0.40 and 0.70, indicators should only be considered for removal in order to fulfill the second criterion, internal consistency reliability (Hair et al., 2011). Internal consistency in PLS models is assessed by testing the composite reliability for each construct. This

measurement is seen as being better suited than Cronbach's alpha for PLS models, because it does not expect equal reliability for all indicators (Chin, 1998). The threshold value of composite reliability is 0.70 for established scales (Hair et al., 2011). As all of the constructs have a composite reliability of 0.70 or higher (Table 29), the criterion of internal consistency is met and no additional indicators need to be excluded from the model. To assess the significance of all remaining indicators, I conducted a bootstrapping in SmartPLS with 5,000 samples (801 cases). Table 28 shows the t-values of this bootstrapping for each indicator. All of them are highly significant ($p < .001$), which further supports indicator reliability.

Table 28: Indicator reliability

Construct	Indicator	Indicator loadings λ (before elimination)	Indicator loadings λ (after elimination)	T-value (after elimination)
Maximization	MAX1	-0.109	-	-
	MAX2	0.101[22]	0.539	4.031***
	MAX3	-0.548	-	-
	MAX4	-0.386	-	-
	MAX5	0.696	0.837	13.286***
	MAX6	0.576	0.803	15.355***
Regret	REG1	0.827	0.829	43.345***
	REG2	0.755	0.760	28.805***
	REG3	0.256	-	-
	REG4	0.739	0.737	23.783***
	REG5	0.785	0.788	34.296***
Lead userness	LU1	0.721	0.721	8.778***
	LU2	0.916	0.918	22.361***
	LU3	0.277	-	-
Product involvement	PI1	0.854	0.853	43.352***
	PI2	0.841	0.855	48.661***
	PI3	0.195	-	-
	PI4	0.405[23]	-	-
	PI5	0.739	0.752	21.891***
	PI6	0.516	0.504	7.936***
Preference fit	FIT1	0.892	0.890	62.777***
	FIT2	0.838	0.842	38.179***
	FIT3	0.872	0.871	49.762***
Process enjoyment	ENJ1	0.857	0.859	52.215***
	ENJ 2	0.915	0.914	98.882***
	ENJ 3	0.908	0.908	87.734***
Overload	OVL1	0.851	0.863	43.471***
	OVL2	0.822	0.824	36.092***
	OVL3	0.757	0.734	18.875***

*** $p < .001$

[22] The loading of MAX2 increased after eliminating the other indicators and thus was retained.
[23] The indicator "PI4" was additionally removed from the model due to its low loading of 0.405 and to achieve the threshold value of 0.5 for the construct's average variance extracted (Hair et al., 2011b).

Convergent validity is measured by the average variance extracted (AVE) for each construct. This measurement indicates how much of the indicators' variance is explained by the construct. A value of 0.50 or higher represents a sufficient degree of convergent validity (Hair et al., 2011). As can be seen by results in Table 29, the AVE is higher than 0.50 for all of the constructs. Thus, the criterion of convergent validity is fulfilled for the measurement model.

Table 29: Internal consistency reliability and convergent validity

Construct	Composite reliability	Average variance extracted
Maximization	0.777	0.545
Regret	0.861	0.607
Lead userness	0.808	0.681
Product involvement	0.836	0.570
Preference fit	0.901	0.753
Process enjoyment	0.923	0.799
Overload	0.850	0.654

Discriminant validity must be assessed by two measures (Hair et al., 2011). First, cross loadings have to be checked as discriminant validity requires items to load highest on their related construct rather than on any other constructs in the model (Campbell and Fiske, 1959, Chin, 1998). As seen in Table 30, all indicators load highest on their respective construct. Second, according to the Fornell-Larcker criterion (Fornell and Larcker, 1981), the square root of a construct's AVE needs to be higher than any of the construct's correlations with other latent variables. Table 31 shows the correlations between the constructs as well as the square root of the constructs' AVE. The Fornell-Larcker criterion is fulfilled for all latent constructs. Thus, the prerequisite of discriminant validity is met for this study.

Table 30: Discriminant validity: Cross loadings

		Maximi-zation	Regret	Lead Userness	Product involve-ment	Preference fit	Process enjoyment	Overload
Maximi-zation	MAX2	**0.539**	0.295	0.237	0.099	0.108	0.095	0.120
	MAX5	**0.838**	0.044	0.199	0.187	0.153	0.147	-0.102
	MAX6	**0.803**	0.068	0.246	0.153	0.126	0.151	-0.047
Regret	REG1	0.091	**0.829**	0.223	0.021	-0.020	0.041	0.244
	REG2	0.156	**0.760**	0.228	0.010	-0.002	0.040	0.223
	REG4	0.110	**0.737**	0.089	-0.061	-0.028	-0.018	0.234
	REG5	0.090	**0.788**	0.206	-0.024	-0.002	-0.005	0.244
Lead userness	LU1	0.250	0.095	**0.721**	0.188	0.096	0.118	-0.027
	LU2	0.250	0.265	**0.918**	0.199	0.108	0.196	0.099
Product involve-ment	PI1	0.196	-0.020	0.154	**0.853**	0.180	0.239	-0.063
	PI2	0.176	0.028	0.263	**0.855**	0.222	0.290	-0.035
	PI5	0.154	0.021	0.223	**0.752**	0.093	0.214	0.006
	PI6	0.072	-0.106	0.013	**0.504**	0.136	0.160	-0.080
Preference fit	FIT1	0.162	-0.029	0.125	0.198	**0.890**	0.521	-0.125
	FIT2	0.172	-0.003	0.067	0.205	**0.842**	0.406	-0.076
	FIT3	0.118	-0.011	0.128	0.163	**0.871**	0.452	-0.093
Process enjoyment	ENJ1	0.165	-0.027	0.103	0.248	0.427	**0.859**	-0.145
	ENJ2	0.170	0.046	0.229	0.283	0.502	**0.914**	-0.100
	ENJ3	0.151	0.024	0.190	0.292	0.492	**0.908**	-0.135
Overload	OVL1	-0.038	0.274	0.064	-0.040	-0.171	-0.163	**0.863**
	OVL2	-0.031	0.233	0.053	-0.065	-0.079	-0.134	**0.824**
	OVL3	-0.038	0.226	0.027	-0.030	0.032	0.004	**0.734**

Table 31: Discriminant validity: Correlations and Fornell-Larcker assessment

	Mean	SD	Maximi-zation	Regret	Lead userness	Product involve-ment	Pre-ference fit	Process enjoy-ment	Over-load
Maximi-zation	5.35	1.15	**0.738**						
Regret	3.93	1.48	0.142	**0.779**					
Lead userness	4.29	1.61	0.296	0.240	**0.825**				
Product involvement	6.12	0.95	0.205	-0.017	0.230	**0.755**			
Preference fit	5.84	1.15	0.176	-0.017	0.122	0.219	**0.868**		
Process enjoyment	6.14	0.92	0.181	0.018	0.198	0.308	0.532	**0.894**	
Overload	2.95	1.42	-0.043	0.304	0.063	-0.056	-0.114	-0.140	**0.809**

Note: Diagonal of the matrix contains the square root of the AVE

In addition, I test for multicollinearity as the two latent variables product value and process value are highly correlated ($\rho = 0.532$). I use the same criteria as described in chapter 4.3.3 and assess the tolerance as well as the variance inflation factors between these variables. In partial least squares modeling, the upper threshold value for the variance inflation factor (VIF) is 5 whereas the lower limit for tolerance is 0.20 (Hair et al., 2012). Results indicate that there is no multicollinearity present in the data as all values are considerably distant from these threshold values (Table 32).

Table 32: Test for multicollinearity

Construct	Tolerance	Variance inflation factor
Maximization	0.848	1.179
Regret	0.839	1.191
Lead userness	0.834	1.200
Product involvement	0.863	1.158
Preference fit	0.710	1.408
Process enjoyment	0.666	1.502
Overload	0.893	1.120

6.5.2 Investigating common method variance

To determine the influence of common method variance I use three methods: Harman's single factor test, analysis of correlations, and inclusion of a common latent factor into the research model. First, I carry out Harman's single factor test. For this purpose, I conduct a confirmatory factor analysis and look at the unrotated results (cf. Iverson and Maguire, 2000, Podsakoff et al., 2003). The number of factors must be restricted to one. A common method bias is present in the data if one factor accounts for the majority of the variance. As the variance explained by only one factor is only 19.4%, there is no single factor that can explain the majority of the variance.

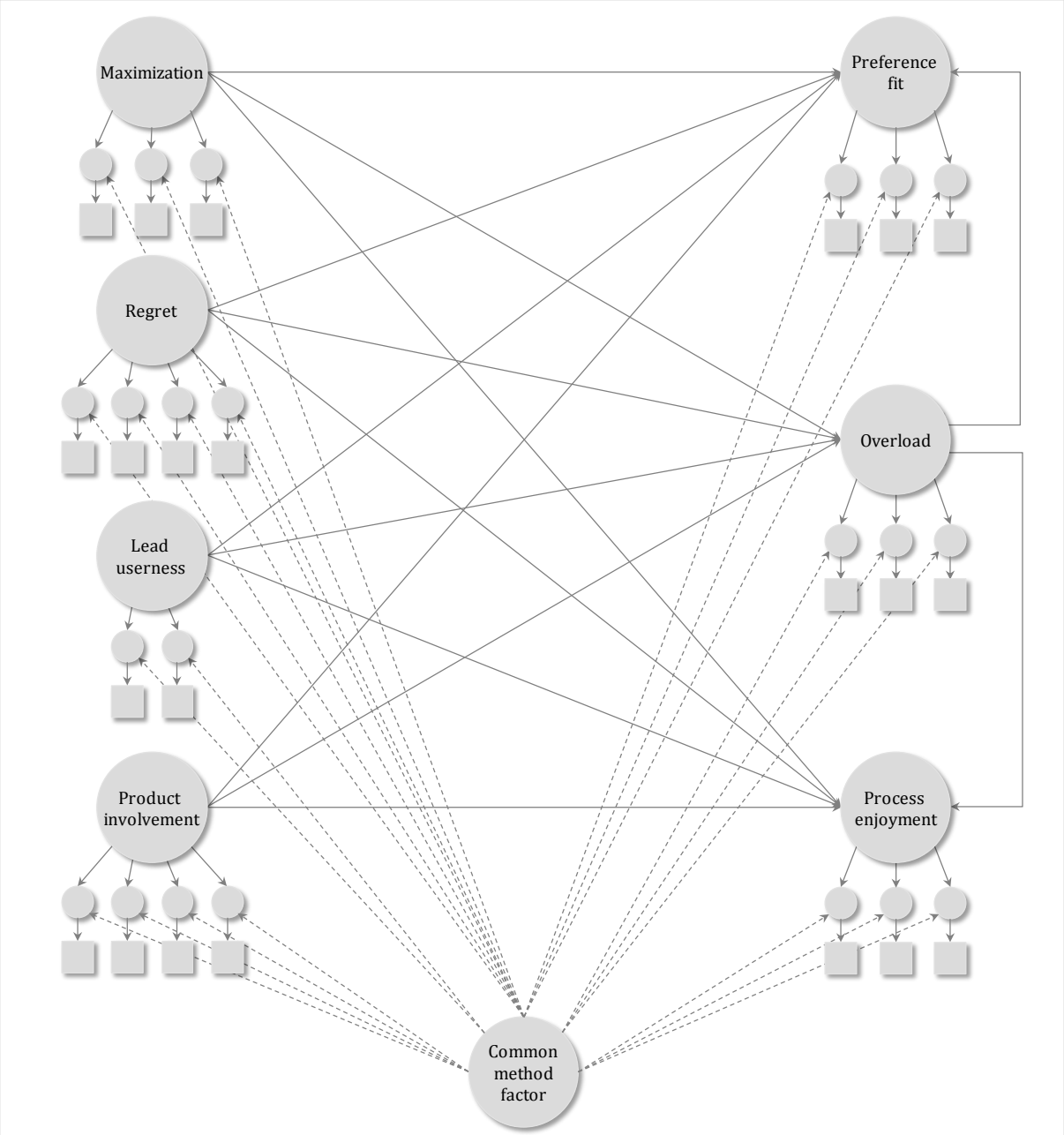
In a second step I review the partial correlations of all constructs of the model (Pavlou, Huigang, and Yajiong, 2007). Very high correlations (> 0.9; cf. Pavlou et al., 2007) would provide evidence for a potential common method bias. However, the highest correlation is 0.532 (see Table 31), which again indicates that no substantial common method bias exists in this study.

Finally, I conduct a single-common-method factor test (Podsakoff et al., 2003). This method was also used und further operationalized in PLS by other scholars such as Liang, Saraf, Hu, and Xue (2007) and Schweisfurth (2012). The single-common-method factor approach integrates a common latent factor into the PLS model and relates this construct to all indicators in the model. As PLS does not allow indicators to be related to more than one construct, each indicator of each latent variable has to be transformed into a single-indicator construct. This procedure does not impact the research model itself, because single-indicator constructs are statistically identical to the actual indicators (Liang et al., 2007). The common method construct is then connected to all these single indicator constructs in order to control for common method variance.

In this model I assess to what extent the measurement model differs to the original one. For this reason I compare the indicator loadings of the model depicted in Figure 37 with the original indicator loadings (Schweisfurth, 2012). I run a bootstrapping (5,000 samples, 801 cases) in order to determine the significance of the indicators. Results indicate that common method bias is unlikely to be a serious issue in this study due to three observations (see Table 33):

1. All indicators that have been included in the original measurement model still load significantly on their respective construct.

2. The loadings of all indicators on their principal construct do not strongly change in size (see column Δ loadings (2)-(1) in Table 33); the average absolute difference between both models being 0.028.
3. The loadings of all indicators on their respective construct are considerably higher than the loadings of the same indicator on the common method variance factor (CMVF).



Source: adapted from Liang et al. (2007) and Schweisfurth (2012)

Figure 37: PLS model for testing common method variance

Table 33: Common method variance test results

		Original model (1)		Model (2) incl. common method variance factor (CMVF)				
		Loadings on construct	**T-value construct**	**Loadings on construct**	**T-value construct**	**Δ loadings (2)-(1)**	**Loadings on CMVF**	**T-value CMVF**
Maximi-zation	MAX2	0.539	4.031	0.600	12.656	0.061	0.239	0.275
	MAX5	0.838	13.286	0.804	33.624	-0.033	0.347	0.463
	MAX6	0.803	15.355	0.797	40.777	-0.006	0.328	0.169
Regret	REG1	0.829	43.345	0.833	60.752	0.004	0.069	0.924
	REG2	0.760	28.805	0.767	39.001	0.007	0.086	1.574
	REG4	0.737	23.783	0.727	28.647	-0.011	-0.015	2.082
	REG5	0.788	34.296	0.785	44.261	-0.003	0.037	0.357
Lead userness	LU1	0.721	8.778	0.829	58.003	0.108	0.296	0.989
	LU2	0.918	22.361	0.837	61.931	-0.081	0.345	1.000
Product involve-ment	PI1	0.853	43.352	0.867	42.561	0.014	0.508	0.892
	PI2	0.855	48.661	0.836	33.017	-0.020	0.552	2.772
	PI5	0.752	21.891	0.801	30.318	0.049	0.435	2.148
	PI6	0.504	7.936	0.450	5.960	-0.054	0.291	0.510
Pre-ference fit	FIT1	0.890	62.777	0.882	29.339	-0.008	0.697	2.311
	FIT2	0.842	38.179	0.834	24.086	-0.008	0.619	0.550
	FIT3	0.871	49.762	0.887	40.362	0.017	0.645	1.935
Process enjoy-ment	ENJ1	0.859	52.215	0.870	26.857	0.011	0.690	2.249
	ENJ2	0.914	98.882	0.910	27.737	-0.004	0.767	1.478
	ENJ3	0.908	87.734	0.902	26.221	-0.006	0.758	0.962
Overload	OVL1	0.863	43.471	0.807	40.340	-0.056	-0.217	3.068
	OVL2	0.824	36.092	0.830	55.019	0.006	-0.171	1.103
	OVL3	0.734	18.875	0.805	45.092	0.070	-0.043	4.497

6.5.3 Structural model

After assessing the measurement model and confirming its validity and reliability, the structural model can be analyzed. The structural model refers to the inner part of the model and investigates the relationships between the constructs. In contrast to co-variance-based methods, partial least squares modeling does not provide any global criteria for model quality and goodness-of-fit. Instead, researchers need to evaluate variance-based, non-parametric criteria to assess the quality of the inner model (Chin, 1998, Henseler, Ringle, and Sinkovics, 2009, Hair et al., 2012). These criteria comprise the effect size (explained variance), the significance of the path coefficients, and the predictive relevance (Hair et al., 2011).

The effect size (R^2) is crucial for assessing the quality of the inner model (Hair et al., 2012). However, the quality conditions for this value are strongly influenced by the research discipline. For consumer behavior studies like this one, R^2 values of 0.20 are already considered high (Hair et al., 2011). Likewise, Peterson, Albaum, and Beltramini (1985) in a meta-analysis of 118 consumer behavior experiments, identified that the average effect size was 0.11. Following these references, results indicate a moderate share of explained variance of all three endogenous constructs, ranging from $R^2 = 0.111$ for preference fit to $R^2 = 0.140$ for overload and $R^2 = 0.169$ for process enjoyment.

To determine the significance of the path coefficients, a bootstrapping procedure is run (5,000 samples, 801 cases). As the path coefficients in PLS can be interpreted in the same way as standardized beta coefficients of ordinary least square regressions (Hair et al., 2011), critical t-values from OLS regression can be applied to determine the significance levels of the path coefficients. An overview of the results is provided in Figure 38 and Table 34. An extended table including the control variables mentioned earlier can be found in appendix B of this thesis. I structure the findings based on the three dependent constructs: preference fit, process enjoyment, and overload.

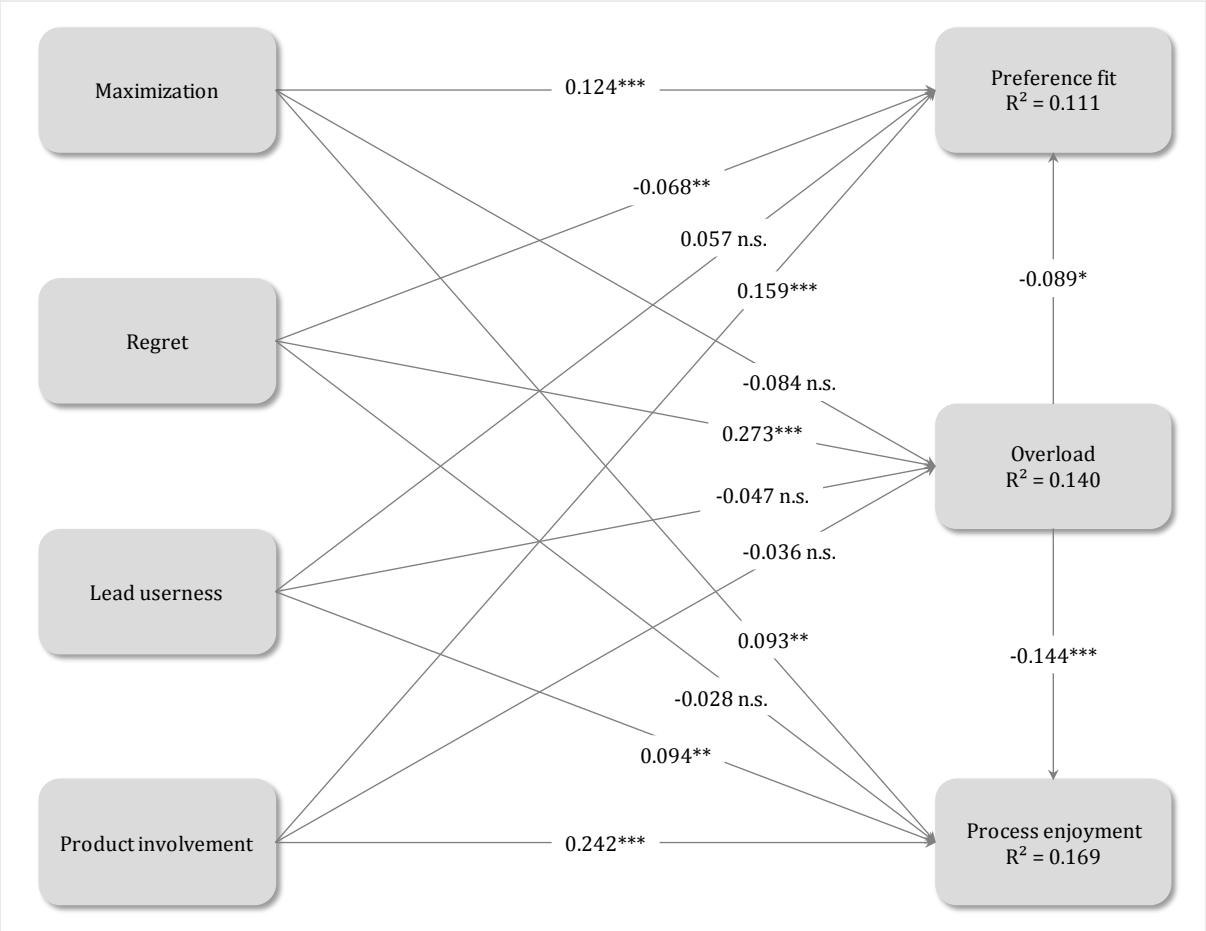


Figure 38: Results of the structural model

Preference fit

First, the central value driver of customization, preference fit, is assessed. Preference fit has four significant predictors in the proposed structural model. In terms of personality traits, maximization is significantly positively related to this construct (ß = 0.124; $p < .001$) whereas regret significantly negatively affects preference fit (ß = -0.068; $p < .01$). Thus hypotheses H_{1a} and H_{2a} are supported. Concerning the investigated domain-specific consumer attributes, only product involvement is a significant positive predictor of preference fit (ß = 0.159; $p < .001$). Lead userness has no substantial influence (ß = 0.057; n. s.). Therefore, I find support for hypothesis H_{4a} but have to reject hypothesis H_{3a}. In addition, a considerable negative influence of overload on preference fit can be identified (ß = -0.089; $p < .05$), which supports hypothesis H_5.

Process enjoyment

The second value driver of customization that I included in this study is process enjoyment. Again, three of the four antecedents have a significant influence on this value driver. Maximization positively affects the perceived process enjoyment (ß = 0.093; $p < .01$). In addition, both lead userness and product involvement have a positive effect on process enjoyment ($ß_{LU} = 0.094$; $p < .01$; $ß_{INV} = 0.242$; $p < .001$). These findings provide support for hypotheses H_{1b}, H_{3b}, and H_{4b}. Although I find a negative relationship between regret and process enjoyment, the significance of this effect remains marginally below the critical t-value of 1.96 (ß = -0.028; t = 1.892). Thus, hypothesis H_{2b} is only marginally supported by the results. Moreover, I find a significant negative effect of overload on process enjoyment (ß = -0.144; $p < .001$), which supports hypothesis H_6.

Overload

The third dependent construct of the structural model is overload. I find regret to be a strong positive predictor of a consumer's perceived overload (ß = 0.273; $p < .001$). This finding supports hypothesis H_{2c}. In addition, instead of the hypothesized increase of overload for maximizers, I find a negative effect of maximization on overload. However, this effect remains marginally below the critical t-value (ß = -0.084; t = 1.927). Thus, hypothesis H_{1c} is not supported. Regarding the two domain-specific consumer attributes, lead userness and product involvement, no significant effects can be identified ($ß_{LU} = -0.047$; n. s.; $ß_{INV} = -0.036$; n. s.). Hypotheses H_{3c} and H_{4c} are therefore not supported by the results.

Table 34: Overview of hypotheses tests

Hypo-thesis	Exogenous construct	Endogenous construct	Direction of hypothesis	Path coefficient ß	T-value (bootstrap)	Support of hypothesis
1a	Maximization	Preference fit	+	0.124	3.387***	yes
1b	Maximization	Process enjoyment	+	0.093	2.884**	yes
1c	Maximization	Overload	+	-0.084	1.927	no
2a	Regret	Preference fit	-	-0.068	2.648**	yes
2b	Regret	Process enjoyment	-	-0.028	1.892	marginal
2c	Regret	Overload	+	0.273	7.313***	yes
3a	Lead userness	Preference fit	+	0.057	1.552	no
3b	Lead userness	Process enjoyment	+	0.094	2.860**	yes
3c	Lead userness	Overload	-	-0.047	1.183	no
4a	Product involvement	Preference fit	+	0.159	3.790***	yes
4b	Product involvement	Process enjoyment	+	0.242	6.548***	yes
4c	Product involvement	Overload	-	-0.036	1.002	no
5	Overload	Preference fit	-	-0.089	2.076*	yes
6	Overload	Process enjoyment	-	-0.144	3.757***	yes

n = 801;
* t-value ≥ 1.96 ($p < 0.05$)
** t-value ≥ 2.58 ($p < 0.01$)
*** t-value ≥ 3.29 ($p < 0.001$)

Finally, the predictive relevance of the structural model needs to be assessed (Hair et al., 2011). For this purpose, the cross-validated redundancy Q^2 is calculated via a blindfolding procedure in SmartPLS (cf. Tenenhaus, Vinzi, Chatelin, and Lauro, 2005). This method excludes data points with a certain pattern (defined by the omission distance) and estimates the omitted data according to the model. If the value Q^2 is greater than zero, the independent constructs have predictive relevance for the endogenous constructs. The omission distance was set to d = 8 (a value between 5 and 10 is recommended, cf. Hair et al., 2011). For all the three constructs, Q^2 values are above zero, indicating sufficient predictive power of the independent constructs ($Q^2_{Fit} = 0.083$; $Q^2_{Overload} = 0.088$; $Q^2_{Enjoyment} = 0.132$).

6.5.4 The impact on consumers' purchase decision

Next, I test the second part of the model in a hierarchical logistic regression. In model 1 the same control variables as in the PLS model are included (age, gender, educational degree, dummies for questionnaire languages, and date of customization). In model 2 of the logistic regression the three predictor variables are added as a separate block. Results are shown in Table 35. All three hypotheses H_7, H_8, and H_9, are supported. Preference fit, process enjoyment, and overload are significant predictors of consumers' purchase decision. A one-unit increase in perceived preference fit (SD = 1.15) increases the likelihood to purchase the customized product by 43.0% (Wald's $\chi^2 = 20.373$; $p < .001$). Likewise, a one-unit increase in process enjoyment (SD = 0.92) increases the purchase probability by 21.7% (Wald's $\chi^2 = 4.188$; $p < .05$). In contrast, a one-unit increase in overload (SD = 1.42) reduces the likelihood of purchase by 11.3% (Wald's $\chi^2 = 4.639$; $p < .05$). Both the full model and the separate block of the three hypothesized predictor variables are significant ($\chi^2_{Full} = 68.047$; $p < .001$; $\chi^2_{Block} = 56.008$; $p < .001$).

In addition I conduct a Hosmer-Lemeshow test (Hosmer and Lemeshow, 1980) to determine the goodness-of-fit of the model. The test segregates the data set into deciles in order to test the predictive capability of the model. Testing of the predictive power is done by comparing the expected and the observed frequencies in each decile (Table 36). A high difference indicates little predictive power of the model and leads to large chi-square values. If the test is not significant ($p > .05$), the model provides an adequate fit and has great predictive power. Results for the full model indicate a good fit as the Hosmer-Lemeshow test is not significant ($\chi^2 = 10.604$; $p = .225$).

Table 35: Hierarchical logistic regression results (DV: purchase)

	Model 1				Model 2			
	B	Std. Error	Wald's χ^2	Exp (B)	B	Std. Error	Wald's χ^2	Exp (B)
Age	0.014	0.008	3.175	1.014	0.018	0.008	4.683*	1.018
Gender	-0.155	0.161	0.919	0.857	-0.219	0.168	1.691	0.803
Educational degree	-0.215	0.090	5.709*	0.807	-0.132	0.094	1.975	0.876
Language dummy (ENG)	-0.275	0.177	2.394	0.760	-0.308	0.189	2.654	0.735
Language dummy (FRE)	-0.103	0.182	0.321	0.902	-0.080	0.196	0.165	0.923
Date of customization	-0.027	0.042	0.398	0.974	-0.058	0.044	1.699	0.944
Preference fit					0.358	0.079	20.373***	1.430
Process enjoyment					0.196	0.096	4.188*	1.217
Overload					-0.119	0.055	4.639*	0.887
Nagelkerke R^2				0.02				0.109
χ^2 omnibus test of coefficients (block)				12.039				56.008***
χ^2 omnibus test of coefficients (model)				12.039				68.047***
Overall percentage predicted correctly				56.1%				64.0%

n = 801;
* $p < .05$
** $p < .01$
*** $p < .001$

Table 36: Contingency table for Hosmer and Lemeshow test

	Purchase = no		Purchase = yes		
Decile	Observed	Expected	Observed	Expected	Total
1	57	56.83	23	23.17	80
2	50	47.64	30	32.36	80
3	44	42.80	36	37.20	80
4	39	38.42	41	41.58	80
5	32	34.77	48	45.23	80
6	22	31.76	58	48.24	80
7	34	29.01	46	50.99	80
8	23	26.17	57	53.83	80
9	30	23.08	50	56.92	80
10	18	18.51	63	62.49	81

6.5.5 Model comparison between buyers and non-buyers

Finally, I test whether the structural equation model differs between buyers and non-buyers. To assess differences between groups in partial least squares modeling, the original sample is divided a priori into the different groups (Sarstedt, Henseler, and Ringle, 2011). This procedure has already been successfully applied in past research (e.g., see Sánchez-Franco, 2006). Therefore I split the sample into buyers (purchase = yes) and non-buyers (purchase = no), resulting in a sample size of n = 452 for the group of buyers and n = 349 for the group of non-buyers.

The amount of explained variance (R^2) considerably changes compared to the full sample and also differs between buyers and non-buyers (Table 37). Compared with the full model, a higher share of variance for the preference fit can be explained for non-buyers ($R^2_{Non\text{-}buyers} = 0.157$). Similarly, I am also able to explain a much higher amount of the observed variance of process enjoyment for non-buyers ($R^2_{Non\text{-}buyers} = 0.269$). By contrast, the R^2 value of cognitive overload is considerably higher for buyers ($R^2_{Buyers} = 0.186$).

Table 37: Variance explained (R^2) for buyers and non-buyers

	R^2 (full sample)	R^2 (buyers)	R^2 (non-buyers)
n	801	452	349
Preference fit	0.111	0.100	0.157
Process enjoyment	0.169	0.133	0.269
Overload	0.140	0.186	0.124

To further analyze this change in R^2, I assess the significance of the hypothesized paths for both groups (Table 38). For buyers, maximization significantly affects all three endogenous constructs in the hypothesized directions ($ß_{MAX\text{->}FIT} = 0.083$; $p < .05$; $ß_{MAX\text{->}ENJ} = 0.042$; $p < .05$; $ß_{MAX\text{->}OVL} = -0.132$; $p < .05$). This is not the case for non-buyers: none of the paths show significant results ($ß_{MAX\text{->}FIT} = 0.106$; n. s.; $ß_{MAX\text{->}ENJ} = 0.068$; n. s.; $ß_{MAX\text{->}OVL} = 0.016$; n. s.). Similar to results from the full sample, consumers' tendency towards regret strongly affects cognitive overload for buyers and non-buyers (buyers: $ß_{REG\text{->}OVL} = 0.384$; $p < .001$; non-buyers: $ß_{REG\text{->}OVL} = 0.173$; $p < .01$). Lead userness again has no significant effect on process enjoyment for buyers ($ß_{LU\text{->}ENJ} = 0.021$; n. s.). However, this effect is strongly present in the non-buyers group ($ß_{LU\text{->}ENJ} = 0.198$;

p < .001). Furthermore, for non-buyers I find a positive significant effect of lead userness on preference fit ($ß_{LU->FIT}$ = 0.129; p < .05). Similarly to the results from the full sample, product involvement strongly affects buyers' and non-buyers' perceived preference fit and process enjoyment (buyers: $ß_{INV->FIT}$ = 0.199; p < .001; $ß_{INV->ENJ}$ = 0.173; p < .001; non-buyers: $ß_{INV->FIT}$ = 0.192; p < .001; $ß_{INV->ENJ}$ = 0.315; p < .001). Opposed to the full sample results, the effect of overload on preference fit and process enjoyment is not significant for buyers ($ß_{OVL->FIT}$ = -0.023; n. s.; $ß_{REG->ENJ}$ = -0.042; n. s.). For non-buyers, however, the effect of overload strongly negatively affects consumers' process enjoyment ($ß_{OVL->ENJ}$ = -0.154; p < .01). The negative effect of overload on preference fit remains insignificant ($ß_{OVL->FIT}$ = -0.098; n. s.).

Finally, I compare the differences between buyers and non-buyers and test for statistical significance by applying the same procedure as Keil, Tan, Wei, Saarinen, Tuunainen, and Wassenaar (2000) and Sánchez-Franco (2006). For their multi-group analyses, the authors calculated a t-value according to the following equation (Keil et al., 2000, Sánchez-Franco, 2006):

$$t = \frac{ß_{Buyers} - ß_{Non-buyers}}{\sqrt{\frac{(m-1)}{(m+n-2)} \times SE^2_{Buyers} + \frac{(n-1)}{(m+n-2)} \times SE^2_{Non-buyers}} \times \sqrt{\frac{1}{m} + \frac{1}{n}}}$$

where t = t-statistic with m + n – 2 degrees of freedom

ß = path coefficient in structural model

SE = standard error of path in structural model

m = sample size of buyers

n = sample size of non-buyers

The difference is significant for three paths: REG -> OVL (t = 2.783; p < .01), LU -> ENJ (t = 2.309; p < .05), and INV -> ENJ (t = 1.978; p < .05). Results indicate that the effect of regret on overload is significantly stronger for buyers than for non-buyers. By contrast, the effect of lead userness as well as the effect of product involvement on process enjoyment is significantly stronger for non-buyers.

Table 38: T-tests for multi-group analysis

		Buyers (n = 452)		Non-buyers (n = 349)		Significance of difference (Keil et al., 2000)
Hypothesis	**Path**	**ß**	**T-value (bootstrap)**	**ß**	**T-value (bootstrap)**	
1a	MAX -> FIT	0.083	2.387*	0.106	1.702	n.s.
1b	MAX -> OVL	-0.132	2.412*	0.016	0.217	n.s.
1c	MAX -> ENJ	0.042	2.026*	0.068	1.100	n.s.
2a	REG -> FIT	-0.051	1.670	-0.041	1.063	n.s.
2b	REG -> OVL	0.384	7.253***	0.173	2.878**	p < .01
2c	REG -> ENJ	-0.028	1.699	0.002	0.437	n.s.
3a	LU-> FIT	0.007	0.361	0.129	2.213*	n.s.
3b	LU -> OVL	-0.040	1.284	-0.035	0.531	n.s.
3c	LU -> ENJ	0.021	1.580	0.198	3.748***	p < .05
4a	INV -> FIT	0.199	3.341***	0.192	3.258**	n.s.
4b	INV -> OVL	0.027	0.318	-0.100	1.825	n.s.
4c	INV -> ENJ	0.173	4.322***	0.315	6.637***	p < .05
5	OVL -> FIT	-0.023	0.623	-0.098	1.453	n.s.
6	OVL -> ENJ	-0.042	1.595	-0.154	2.737**	n.s.

* t-value ≥ 1.96 (p < .05)
** t-value ≥ 2.58 (p < .01)
*** t-value ≥ 3.29 (p < .001)

6.6 Discussion and implications

6.6.1 Summary of results

In this study I tested the influence of consumer-specific antecedents on three variables that affect the value for consumers in mass customization – that is, preference fit, process enjoyment, and overload. I also assessed the effect of these variables on consumers' decision to purchase the customized product. Finally, I compared buyers and non-buyers with regards to the effect of the hypothesized antecedents. My findings are summarized as follows.

I tested the influence of two personality traits: maximization and regret. Results show a significant positive effect of maximization on preference fit (H_{1a}) and process

enjoyment (H_{1b}). Furthermore, a significant negative effect of maximization on cognitive overload could be identified for buyers of customized products, which is in contrast to the initial hypothesis H_{1c}. Consumers' tendency to experience regret strongly affects cognitive overload (H_{2c}), which also holds true for both groups, buyers and non-buyers and is even significantly higher for buyers. In addition, regret negatively influences preference fit (H_{2a}) and process enjoyment (H_{2b}). However, these effects are rather weak and can only be observed in the full sample.

Besides personality traits, I also assessed the impact of two domain-specific consumer attributes: lead userness and product involvement. Consumers' lead userness significantly affects their perceived preference fit (H_{3a}) and process enjoyment (H_{3b}). Interestingly, this finding only holds true for non-buyers. Product involvement showed a consistently strong positive influence on preference fit (H_{4a}) and process enjoyment (H_{4b}). Neither lead userness nor product involvement significantly reduced cognitive overload. Thus, H_{3c} and H_{4c} cannot be confirmed.

Cognitive overload negatively influences preference fit (H_5) and process enjoyment (H_6); this negative effect is stronger for process enjoyment than for preference fit. In the multi-group comparison, overload particularly negatively affects process enjoyment of non-buyers whereas the negative influence remains insignificant for buyers.

Finally, I investigated the effect of preference fit, process enjoyment and overload on the purchase decision. As hypothesized, both preference fit (H_7) and process enjoyment (H_8) positively influence the probability of purchasing the customized product whereas overload (H_9) negatively influences the likelihood of purchase. The effect size is much stronger for preference fit than for the other two variables. Table 39 summarizes the results of this study.

Table 39: Summary of results

Analysis	Hypo-thesis	Path	Direction of hypothesis	ß full sample (n = 801)	ß buyers (n = 452)	ß non-buyers (n = 349)	Support of hypothesis
PLS-SEM	1a	MAX -> FIT	+	0.124***	0.083*	0.106	yes
	1b	MAX -> ENJ	+	0.093**	0.042*	0.068	yes
	1c	MAX -> OVL	+	-0.084	-0.132*	0.016	no, reversed for buyers
	2a	REG -> FIT	-	-0.068**	-0.051	-0.041	yes
	2b	REG -> ENJ	-	-0.028	-0.028	0.002	marginal
	2c	REG -> OVL	+	0.273***	0.384***	0.173**	yes
	3a	LU-> FIT	+	0.057	0.007	0.129*	for non-buyers only
	3b	LU -> ENJ	+	0.094**	0.021	0.198***	yes
	3c	LU -> OVL	-	-0.047	-0.040	-0.035	no
	4a	INV -> FIT	+	0.159***	0.199***	0.192***	yes
	4b	INV -> ENJ	+	0.242***	0.173***	0.315***	yes
	4c	INV -> OVL	-	-0.036	0.027	-0.100	no
	5	OVL -> FIT	-	-0.089*	-0.023	-0.098	yes
	6	OVL -> ENJ	-	-0.144***	-0.042	-0.154**	yes
				B			
Logistic regression	7	FIT -> Purchase	+	.358***			yes
	8	ENJ -> Purchase	+	.196*			yes
	9	OVL -> Purchase	-	-.119*			yes

* $p < 0.05$
** $p < 0.01$
*** $p < 0.001$

6.6.2 Discussion

My findings open up a more differentiated view of the value of mass customization than has emerged so far. Results indicate that consumers with maximizing tendencies particularly benefit from mass customization as they perceive a higher fit of their

customized product and more strongly enjoy the customization process. This finding is supported by results from section 6.4.5, where I identified that a considerable number of consumers value the number of options and even prioritize them over the price of the product: the higher the number of options, the more likely it is for maximizers to reach the ideal solution. Moreover, I found maximizing buyers to feel less overloaded by the number of options, which is in contrast to my initial hypothesis. As this particularly holds true for buyers, I would conclude that mass customization is an attractive alternative for maximizing consumers to make their decisions.

How can this finding be explained? One reason for the surprising result might be that the complicated decision process is split into many smaller decisions in mass customization which are easier to compare and to process mentally. Maximizers are characterized by setting high standards and seeking for the best available alternative in order to fulfill these high standards (Schwartz et al., 2002, Nenkov et al., 2008). The final scale that I applied in this study only reflects these dimensions as I had to exclude the two indicators for decision difficulty (the third sub-dimension of maximization) in order to fulfill the pre-conditions for the measurement model in PLS (see section 6.5.1). In the investigated environment of sports apparel, consumers customize their product with each single attribute (e.g., selecting the color of the shoe sole). Comparing single attributes is less complex than comparing full alternatives that comprise an extensive number of attributes (Valenzuela et al., 2009). This simplification appears to help maximizers to identify the best options that meet their high standards and thus reduces the perceived overload for them.

However, a differentiated view of this positive relationship between a maximizing mindset and the perceived benefits of mass customization, is required. My findings indicate that consumers' proclivity towards regret reduces the value of mass customization, particularly as it increases the perceived cognitive overload. However, this trait has been shown to correlate with maximization (Schwartz et al., 2002). Thus, maximizers can indeed profit from the opportunity to customize their own product, as long as they are prevented from their tendency to anticipate regretting their decisions because this makes them feel overloaded during the customization process.

Moreover, I showed that lead users benefit more from customization than regular users, mainly because they enjoy the customization activity itself to a greater extent. Interestingly, the positive effect of lead userness on process enjoyment is significantly stronger for non-buyers. Thus, mass customization seems to be a valuable approach for

companies to attract lead users simply because of its hedonic process-related benefits. At first this finding is counterintuitive to the original definition of lead users (expecting high benefits from obtaining the actual solution; cf. von Hippel, 1986). Yet it is supported by literature on co-creation and user innovation, as hedonic motives are important reasons for users to engage in such projects (cf. Hertel et al., 2003, Füller et al., 2006, Nambisan and Baron, 2009). Thus, lead users seem to benefit from mass customization due to the process-related value separate from receiving the physical product.

In opposition to this result, I could not identify a significant effect of lead userness on preference fit or overload. This may be due to the specific features of the mass customization system this study was based on, as it primarily provides aesthetic options for customization. However, leading edge needs of lead users may require a larger set of functional options (Morrison, Roberts, and Midgley, 2004). Hence, this lack of functional options might be the reason why I was not able to identify a significant increase in preference fit for lead users in my study. Likewise, lead users are characterized by having advanced technological knowledge about the product (Schreier et al., 2007, Schreier and Prügl, 2008). Based on the results, this knowledge does not help them to reduce design-related overload, which has been dominant in this study.

My finding on the positive effect of product involvement on the value in mass customization, which is also in line with Franke et al. (2009), implies that highly involved consumers not only benefit more strongly from a better preference fit, but also enjoy the design process more than regular consumers do. As this again holds true specifically for non-buyers, this finding might have similar implications for highly involved consumers than for lead users: these types of consumers might simply enjoy experimenting with the customization toolkit without a real intention to buy the product because of a too high price or a lack of specific customizable functional features.

Moreover, overload in the decision making process appears to be a relevant inhibiting factor in the decision to purchase the customized product, as the observed negative effect of cognitive overload on the product and process value in mass customization is particularly present in the group of non-buyers. Further support for this can be found by looking at the main reasons that prevented non-buyers from purchasing their product (see section 6.4.5 for details): 25% stated uncertainty about their own design to be one of the major reasons for not buying the self-designed product. As uncertainty intensifies the difficulty to make a decision (Broniarczyk and Griffin, 2014), consumers who stated to be uncertain may have also felt overloaded by

the number of options. However, by contrast, 26% of the non-buyers were not satisfied with the number of available options. These contradictory findings further support the proposition that individual differences with regards to the perceived value of mass customization exist. While some consumers appear to crave an endless number of options, others quickly feel unsure about their design and seem to prefer a limited variety only.

Finally, this study shows that the process of customization itself is an important determinant in consumers' decision to purchase a product, which is in line with Franke and Schreier (2010). Even though the influence of preference fit is much stronger, process enjoyment significantly positively affects the likelihood of purchase. By contrast, the negative effect of overload on the likelihood of purchase is weaker. However, this relationship might quickly change in the case of high overload as this variable additionally negatively affects the two aforementioned value drivers. Thus, cognitive overload appears to be a serious issue in mass customization, particularly for regretful consumers.

6.6.3 Contribution to theory

This study provides theoretical contributions to three major research streams. The first contribution is related to the literature on mass customization. I extend research on the influence of individual differences in mass customization (Fiore et al., 2004, Franke et al., 2009, Hunt et al., 2013). To be more specific, I establish relationships between maximization as well as regret and the major determinants of value in mass customization – that is, preference fit, process enjoyment, and cognitive overload (Huffman and Kahn, 1998, Franke et al., 2009, Franke and Schreier, 2010). Findings from this study further elucidate which types of consumers actually profit from mass customization by indicating a positive influence of maximization on the perceived value, yet a negative effect of regret on overload. In addition, I replicate the effect of product involvement on preference fit (Franke et al., 2009) amongst real customers and, in parallel, extend this effect towards process enjoyment (Franke and Schreier, 2010) by showing that highly involved consumers receive higher hedonic benefits when customizing their product. Future research on mass customization may incorporate this differentiated perspective, particularly when assessing the value of this business approach for consumers. Moreover, I contribute to mass customization by providing

"real-world validation" of the identified value determinants, as it has been highlighted by Fogliatto et al. (2012: p. 22). I show that preference fit, process enjoyment, and cognitive overload significantly affect the likelihood to purchase a customized product.

My second contribution refers to the interconnection of two distinct research streams. With this study, I establish a link between the value of mass customization (Pine, 1993a, Franke and Piller, 2004, Schreier, 2006, Franke et al., 2009) and lead user theory (von Hippel, 1986, Urban and von Hippel, 1988, Lüthje and Herstatt, 2004, Franke et al., 2006). To the best of my knowledge, this has not been done so far. Findings from my study indicate that lead users benefit significantly more from mass customization than regular users do. This value increase can be primarily ascribed to the increased enjoyment that lead users experience during the process of customization. So far, toolkits have been predominantly viewed as useful for regular users with heterogeneous needs as they enable consumers to get exactly what they want (von Hippel, 2001, von Hippel and Katz, 2002). This study extends this theoretical proposition with a promising approach that also attracts lead users. By contrast, lead users do not appear to benefit more strongly from an increased preference fit as compared to regular users. As stated above, lead users might not be able to satisfy their extensive functional needs (Morrison et al., 2004) through customization as most of the customizable options are of an aesthetic nature. This study may serve as a starting point for a more comprehensive examination of lead users in mass customization.

Finally, I contribute to the intersection of consumer research and social psychology by expanding research on maximization (Schwartz et al., 2002, Jingjing and Roese, 2014, Moyano-Díaz, Martínez-Molina, and Ponce, 2014) and choice overload in consumption (Iyengar and Lepper, 2000, Kuksov and Villas-Boas, 2010, Scheibehenne et al., 2010). Recent research argued that maximizers are particularly susceptible to choice overload (Broniarczyk and Griffin, 2014). However, my findings indicate that there are two types of maximizers who exhibit different tendencies regarding the feeling of choice overload. On the one hand, maximizers who are primarily characterized by having high standards appear to feel less overloaded by the increased number of choices in mass customization. According to Nenkov et al. (2008), Giacopelli, Simpson, Dalal, Randolph, and Holland (2013), and Moyano-Díaz et al. (2014), this sub-dimension is closest to the original definition of a maximizing mindset from Simon (1955). Therefore, my study suggests that the original form of a maximizing mindset benefits from mass customization, as for these types of consumers the value of mass customization is higher

while simultaneously perceived overload is lower. On the other hand, individuals who are prone to experience regret appear to feel more overloaded by variety in consumption. As this trait is highly related to the decision difficulty sub-dimension (Moyano-Díaz et al., 2014), my finding is in line with the argumentation of Nenkov et al. (2008: p. 384f.) who state that the *"source of maximizers' psychological trouble is the need to search extensively and make difficult decisions"*. For these types of consumers, mass customization does not solve their problem of indecisiveness.

By highlighting that the sub-dimensions of maximization have different effects on overload, this study also contributes to the existing discussion about the multidimensionality of maximization (cf. Highhouse et al., 2008, Lai, 2010, Rim et al., 2011, Giacopelli et al., 2013). As indicators regarding decision making difficulty pointed towards the opposite direction in PLS, I had to exclude these items from the maximization scale in order to meet the requirements of the measurement model. This indicates that maximization is indeed a multidimensional construct, which supports existing findings from Lai (2010), Rim et al. (2011), and Turner, Rim, Betz, and Nygren (2012). Future research would therefore benefit from considering this multi-dimensionality, particularly regarding decision making difficulty as a separate dimension, in the investigation of the behavior of maximizing consumers.

6.6.4 Limitations and avenues for future research

This study has several limitations that require further research. Firstly, this study only assessed buyers and non-buyers of a specific product type and customization system. As mentioned above, the customization system in this case primarily consisted of the modification of aesthetic attributes. This raises the question whether these findings can be replicated in other product domains that include customizing a higher quantity of functional attributes.

Next, it would be valuable to extend my findings towards other value drivers in customization. In this study I focused on the analysis of three central value determinants in customization: preference fit, process enjoyment, and cognitive overload. However, as presented in section 2.5 of this dissertation, customization provides additional benefits to consumers such as uniqueness (Franke and Schreier, 2008) or the *"I designed it myself"* effect (Franke et al., 2010b). Investigating the specific antecedents of these

drivers and differentiating their impact on consumers' purchase decision would be highly informative and useful.

Moreover, future research could test the moderating effects of the identified determinants. For example, the identified relationships might be influenced by other underlying mental processes such as epistemic motivation (Amit and Sagiv, 2013) or psychological attachment to (non-)chosen options (Carmon, Wertenbroch, and Zeelenberg, 2003). Likewise, different styles of cognitive processing may affect the perceived difficulty to make decisions (Thompson, Hamilton, and Petrova, 2009). In addition, the influence of maximization on preference fit and cognitive overload might be moderated by the design of the toolkit. As stated before, perceived complexity in customization depends substantially on the type of customization (Valenzuela et al., 2009). In highly complex toolkit environments, the increased value of customization for maximizing consumers might be quickly diminished. Contrastingly, decision aids such as recommender systems are seen to reduce the complexity for consumers (Broniarczyk and Griffin, 2014). Thus, they may serve to moderate the identified relationships between cognitive overload and the value drivers in customization.

Finally, the link between mass customization and lead user theory established in this study requires further investigation. I highlighted that lead users particularly enjoy customizing their own product but do not profit significantly from a higher preference fit. This raises several questions, which call for a more thorough examination. For example, do lead users achieve a higher preference fit in other, more functional customization systems or is the benefit of mass customization generally limited to the process component of value? Vice versa, are lead users even less satisfied with self-designed products because they are not able to fulfill their leading-edge needs with them? In addition, the positive relationship between lead userness and process enjoyment could not be observed for consumers who purchased their self-designed product. This also raises doubts about whether the identified benefits for lead users through mass customization have positive consequences for the company itself. However, extensively dealing with the products of a company, as is the case when users customize their own product, might still lead to an increased level of commitment to the brand (Coelho and Henseler, 2012). Thus, future research should consider investigating the consequences of this positive relationship.

7 Overall discussion and conclusion

7.1 Summary of findings

In this dissertation I dealt with the consumer perspective on mass customization. In three parts I assessed consumers' general interest in customization, their choice behavior during the customization process itself, and finally consumers' perceptions and antecedents of the value of a customized product. This section provides an overview of the major findings from all three parts.

Results from part I of my dissertation indicated that mass customization has lost its status as a niche phenomenon; instead and in line with Fogliatto et al. (2012) and Franke and Hader (2014), this business approach is already well-known by the majority of consumers. Almost two-thirds of the respondents of my online survey indicated that they had purchased at least one customized product in the past three years. Moreover, three out of four respondents were notably interested in customization. This interest was highest for respondents, both male and female, in the apparel and automobile markets. In addition, males showed high interest in customizing laptops whereas females were more interested in designing jewelry. To summarize, mass customization appears to be attractive for both males and females and specifically for products with a high number of functional or aesthetic parameters.

Moreover, I found a significant positive relationship between this interest and two general personality traits: extraversion and openness to experience. These two traits belong to the Big Five inventory (Goldberg, 1990), which is the most prevalent inventory of personality traits and thus allows the classification of individuals along five general dimensions (McCrae and John, 1992, John and Srivastava, 1999). Both extraversion and openness to experience significantly increase interest in customization, indicating that customization is a particularly attractive approach for extraverted consumers and those who are open to new experiences. As extraverted consumers might be particularly interested in showing their self-designed product in public, uniqueness of the

customized item might play an important role for these kinds of consumers, which is in line with Franke and Schreier (2008).

Building upon these findings, I tested participants' preference for uniqueness in mass customization in part II of my thesis. I also focused the subsequent studies of part II and part III on the customization of automobiles and sports apparel as these two categories displayed similar interest for both male and female consumers. In a series of experiments I investigated how consumers make their decisions during the process of customization and elucidated the conflict between consumers' need for uniqueness and need for conformity (Snyder and Fromkin, 1980, Tian et al., 2001, Cialdini and Goldstein, 2004). I tested two different product types, automobiles and sports shoes, where I also distinguished between hedonic and utilitarian attributes (Holbrook and Hirschman, 1982, Batra and Ahtola, 1990). Results showed that consumers pursue both needs in customization: they prefer uniqueness in primarily hedonic attributes while they conform to other consumers in utilitarian attributes. These findings were consistent for both product categories tested and could be replicated in three different experiments, showing that consumers pursue both needs even within one product configuration.

In addition, I showed that this differing choice behavior depends on consumers' product-specific need for uniqueness. Individuals with a high product-specific need for uniqueness more strongly prefer unique options in the hedonic product attributes, which further supports the hypothesis that consumers' (product-specific) need for uniqueness is a relevant determinant in customization (Franke and Schreier, 2008).

This substantial change in preferences also had no significant effect on the perceived preference fit of the customized products. Both participants in the treatment and control groups indicated similar levels of preference fit after completion of customization. This indicated that consumers' preferences were, at least partly, constructed during the process of customization, which is in line with Slovic (1995) and Franke and Hader (2014). However, once customization was completed, consumers were much less susceptible to information about the choices of other consumers; they preferred to keep most of their original design. If at all, they made slight adjustments in order to have a unique configuration in the hedonic attributes of their product, but they did not pursue conformity in the utilitarian attributes anymore. Interestingly, consumers who were told they have a unique product, afterwards stated to have a considerably higher preference fit. This finding emphasizes the importance of uniqueness for hedonic product attributes in mass customization.

Finally, in part III of this thesis I assessed the perceptions of consumers after they had engaged in customization. Again, I was interested in identifying consumer-specific differences related to the perceived value of mass customization. For that purpose, I surveyed real users of a commercial mass customization system for sports apparel.

Results showed that mass customization provides additional value to maximizing consumers by increasing the product- and process-related benefits and simultaneously decreasing cognitive overload for them. However, for consumers who tend towards regret or who have difficulties in making decisions, the value of mass customization is diminished by an increase in cognitive overload. Cognitive overload was also found to negatively affect the perceived preference fit and process enjoyment in mass customization. Moreover, I observed that the value of mass customization is perceived higher by lead users and highly involved consumers, because consumers with these characteristics enjoy the design process more than regular users do. Interestingly, this effect was particularly true for the group of non-buyers.

In addition, this study showed that the likelihood of purchasing the self-designed product is significantly affected by the perceived preference fit (increase by 43.0%), the process enjoyment (increase by 21.7%), and the choice overload (reduction by 11.7%) that consumers experience during the process of customization. Moreover, a considerable number of non-buyers either stated the limited amount of options (26%) or uncertainty about their own design (25%) as major inhibitors preventing them from buying their customized product. This provides additional support for my findings that individual differences determine the value of mass customization: while some maximizing consumers demand an extensive variety of options, others are quickly overloaded, which prevents them from purchasing the customized product.

7.2 Overall discussion and theoretical contributions

This thesis shows that the expected and perceived value of mass customization differs between consumers. Mass customization appears to be particularly attractive for consumers who are extraverted or open to new experiences. This is important as these types of consumers are likely to have different expectations to other consumers, regarding mass customization. They may expect to fulfill their motivational goals of excitement, pleasure, and achievement (Roccas et al., 2002). Drawing on this, value drivers such as enjoyment of the experience of designing the product (Franke and

Schreier, 2010) or the creative achievement (Franke et al., 2010b, Merle et al., 2010), are highly relevant in mass customization in order to satisfy those needs. This is also supported by findings from the third part of my dissertation, where I identified that process enjoyment positively affects the probability of purchasing the customized product.

Besides individual traits, the attractiveness of mass customization is co-determined by the type of product and also varies between male and female consumers. These differences may be a result of the heterogeneous structure of consumers' needs in these product categories (Salvador et al., 2009). In the case of heterogeneous needs, consumers may not be satisfied with existing standard products or their alternatives, as these products can only cover part of their preferences. Therefore, consumers are interested in customizing this type of product in order to achieve a better fulfillment of their individual needs. Thus, based on my findings, consumers' needs are particularly heterogeneous in the automotive and sports apparel industries.

However, results from the second part of my dissertation raise doubts about the real heterogeneity of these needs. My series of experiments showed that users of mass customization toolkits make their choices based on two conflicting needs; the need for uniqueness (Snyder and Fromkin, 1980, Tian et al., 2001) and the need for conformity (Deutsch and Gerard, 1955, Cialdini and Goldstein, 2004). This conformity is in opposition to the original objective of mass customization, which is to fulfill the heterogeneous needs of every individual consumer (Franke and von Hippel, 2003). I showed that the need for conformity can be related to the utilitarian benefits of product attributes as participants of my experiments preferred those options that were most frequently chosen by other consumers. Hence, consumers' needs appear to be far less heterogeneous than expected, at least in the utilitarian attributes of products. However, consumers' needs appear to be highly heterogeneous in the hedonic attributes of customized products, requiring a high number of options in these attributes. This heterogeneity might be ascribed to two different factors. On the one hand, preferences might be especially diverse in these attributes, e.g., preferences for specific colors strongly vary amongst individuals. On the other hand, my results indicate that this heterogeneity is also driven by consumers' product-specific need for uniqueness. The higher this need for uniqueness is, the larger the variety in the hedonic attributes of a certain product category must be in order to allow consumers to differentiate themselves from others. My findings also indicate that fulfilling this need is important, as

explicitly mentioning the uniqueness of the product design increased the perceived preference fit of the participants in my experiment. Moreover, according to the results of part I of my thesis, mass customization particularly attracts extraverted consumers. They are likely to seek differentiation from others in the public, which can be realized by consuming unique products (Lynn and Harris, 1997b). Thus, considering the potentially high share of extraverted consumers amongst users of mass customization systems, the relevance of my finding that consumers seek uniqueness in the hedonic attributes of customized products is further emphasized.

My finding that highly involved consumers show equally strong preferences towards popular options than low involved consumers may be explained by their increased interest in avoiding wrong decisions, because the outcome matters more to highly involved consumers (Zaichkowsky, 1985). This risk aversion might trigger prevention orientation and more thoughtful processing (Florack et al., 2010) of all available information, which in turn drives their tendency to rely on popular options. Thus, without this information or other decision support systems, highly involved consumers might feel similarly uncertain about their configuration than low involved consumers, also leading to a higher likelihood to drop out of the customization process. Although this assumption has not been investigated in the context of this dissertation, results from part III support this idea: A considerable share of respondents did not feel sure enough about their own design which prevented them from buying the self-designed product.

In general, I showed that consumers' preferences can be manipulated and thus seem to be unstable before and during customization, supporting the proposition that consumers' preferences are of a constructive nature (Slovic, 1995, Kramer, 2007, Amir and Levav, 2008). My findings indicate that this holds true even if consumers believe that they have clear preferences before starting to customize their product. My conclusion that preferences are constructed during the process of customization is also in line with Franke and Hader (2014) who identified that mass customization systems can serve as instruments for consumers to learn about their own preferences. It is further supported by my finding that the preference fit is not affected by the observed shift in choices. However, once consumers made their choices, this change in preferences could no longer be observed. This indicates that consumers who have finalized their customized product are far less susceptible to information about other

consumers' choices and prefer to keep their original design. Hence, preferences appear to stabilize after consumers commit to a specific configuration.

As presented above, similarly to the identified individual differences in terms of the interest *before* customizing a product and in terms of the preferences *during* customization, the perceived value of mass customization *after* the actual engagement depends on individual determinants.

Particularly for maximizing consumers (Schwartz et al., 2002), mass customization appears to provide increased benefits. Based on my findings, these benefits do not only result from the increase in preference fit, but also from the increased enjoyment of customization as well as the decreased cognitive overload. As these effects were particularly present in the group of buyers, customization appears to be a promising strategy for firms to attract maximizing consumers. The increased enjoyment indicates that maximizers are able to better satisfy their need for cognition (Cacioppo and Petty, 1982, Nenkov et al., 2008) by customizing their own product, because they prefer to be strongly mentally involved in the purchasing process and value the opportunity to flexibly adjust a product to their specific needs in many different dimensions. Moreover, the reduction in cognitive overload appears to result from simplifying the complicated search for the best solution for maximizers. Instead of having to compare full alternatives, maximizers are able to simply select the option they consider as being superior to the others step by step within each individual product attribute. Thus, modularizing products (Duray et al., 2000, Pil and Cohen, 2006) as is the case in mass customization, appears to be a promising approach to increasing the benefits for maximizing consumers. This finding is particularly important in the light of increasing consumer empowerment (Fuchs and Schreier, 2011, Broniarczyk and Griffin, 2014) as it shows that self-designing a product can reduce decision-making difficulty for some consumers.

However, in the case of regret, the effect seems to be reversed and consumers start to feel more strongly overloaded through mass customization. For these consumers, the variety in mass customization that is supposed to increase the benefits for consumers, backfires and appears to provoke doubts about the customized product. Due to the large number of options, they are no longer able to thoroughly evaluate all possible configurations (Desmeules, 2002) during customization, or they start to brood over foregone options after they have finished customization (Schwartz et al., 2002). This further emphasizes the importance of considering individual differences with respect to

the real value of mass customization. Drawing on these findings, the size of the solution space of a configurator (Franke and Piller, 2004) is likely to be an important additional factor that determines the perceived value for consumers because it affects the perceived preference fit and enjoyment on the one hand, and the risk of too much complexity for consumers on the other hand.

In addition, my finding that lead users and highly involved consumers enjoy the design process in mass customization more than regular users do implies that the customization experience itself is highly relevant in mass customization. This is also in line with research on co-creation, which identified hedonic motives to be a relevant factor for participation in such projects (Füller et al., 2006, Nambisan and Baron, 2009). Furthermore, toolkits might even be used to attract and identify lead users, who have been shown to be a profitable source for companies' innovation management (Lilien, Morrison, Searls, Sonnack, and Hippel, 2002). However, my finding that this process-related benefit was only present amongst non-buyers should be critically investigated. This indicates that lead users' needs might not be fulfilled by existing mass customization systems.

Integrating the findings from part II and III of my thesis, it seems that choice overload, or uncertainty, is a serious concern in mass customization. In part II, I identified that consumers' decisions are not solely guided by their preferences, but also by their needs for conformity and uniqueness, which are in conflict with each other. This is likely to amplify the perceived decision complexity and thus also choice overload in mass customization. In part III, I identified that choice overload diminishes both product- and process-related benefits and reduces the likelihood of purchase. Moreover, many customers stated that uncertainty about their own design prevented them from purchasing their customized product. Hence, it appears to be highly important to support consumers during the process of customization in order to make them feel certain and convinced about their own design by simultaneously fulfilling their different needs.

My dissertation provides theoretical contributions to four major strands of literature, which are presented in the following sub-sections.

7.2.1 Contribution to the literature on mass customization

This dissertation substantially adds to existing research on the benefits and drawbacks of mass customization for consumers (Huffman and Kahn, 1998, Franke and Piller, 2004, Dellaert and Stremersch, 2005, Schreier, 2006, Franke et al., 2009, Franke and Schreier, 2010, Merle et al., 2010). As proposed by Fogliatto et al. (2012), I tested and validated previously identified drivers and their influence on the purchase likelihood in a real customization environment by surveying customers of customized products of a global sporting goods brand. In addition to this validation, I significantly broaden knowledge about the benefits and drawbacks by elucidating the influence of consumers' personality and their affiliation with the product category, on the product and process value as well as the perceived overload. This finding extends prior research of Fiore et al. (2004), Franke et al. (2009), and Hunt et al. (2013) on the role of individual differences in the perception of value in mass customization. Moreover, by showing that these individual differences also exist with regard to the interest in mass customization, I propose that users of a mass customization toolkit are different to regular consumers. This affects research on the definition of toolkits (Liechty, Ramaswamy, and Cohen, 2001, von Hippel and Katz, 2002), as the needs of these users are likely to also be different to the needs of regular consumers.

Furthermore, this thesis extends existing research on consumers' choice behavior in mass customization by highlighting that choices are driven by two opposing forces: the need for uniqueness and the need for conformity. In line with findings by Hildebrand et al. (2013a), I identified conformity as a relevant driver of consumer choices in mass customization alongside uniqueness. This is particularly important as conformity is opposed to the pre-condition for the success of a mass customization system in the literature, which is the heterogeneity of consumers' needs (Salvador et al., 2009). This calls for a differentiated perspective on the existing idea of what consumers want when they customize their own product. Instead of explicitly focusing on uniqueness (Franke and Schreier, 2008, Merle et al., 2010), research should incorporate the need for conformity and thus should consider mass customization as a tool to achieve the right mix of both needs.

I also find support for the findings of Franke and Hader (2014) that consumers learn about their preferences during customization. Furthermore, I extend this finding by showing that preferences are unstable and can be manipulated during the process of

customization, but appear to stabilize after consumers have completed their customization. This finding might be related to the value of self-expression in customized products (Merle et al., 2010) and may indicate that consumers, once they have finished customization, identify themselves with the customized product and create a greater cognitive bond to it (Atakan et al., 2014). However, this proposition could not be tested within the scope of this dissertation and thus requires validation by future research.

7.2.2 Contribution to the literature on user innovation

This dissertation also provides implications for research on user innovation and co-creation (Nambisan, 2002, von Hippel, 2005, Greer and Lei, 2012, Poetz and Schreier, 2012) by showing that the degree of uniqueness of a user-created product is contingent on the characteristics of the product. Based on my findings, participants of co-creation projects are likely to develop novel and unique solutions for products that primarily offer hedonic benefits to consumers. This complements recent work by Stock et al. (2015) who showed that consumers' hedonic motives affect the novelty of customized goods. Anticipating the hedonic benefits of a new product might provoke hedonic motives during the co-creation process and thus also lead to novel or unique solutions. By contrast, the observed proclivity towards conformity in utilitarian attributes might diminish novelty of co-creation projects that focus on collaborative idea generation in utilitarian product categories. Thus, depending on the characteristics of the development task, consumers' differing needs might affect the outcome of such a project.

In addition, I establish a link between the two research streams of mass customization and lead user theory (von Hippel, 1986, Urban and von Hippel, 1988, Morrison et al., 2004, Franke et al., 2006). To the best of my knowledge, this has not been done so far, despite having been theorized by von Hippel (2001) more than a decade ago. By showing that lead users in particular, profit from the customization experience, my results expand prior findings on lead users who have been primarily characterized by the benefits they expect from obtaining an advanced technical solution in the future (Franke et al., 2006, Schreier et al., 2007). It appears that lead users do not only profit from this new product, but also significantly profit from the design process itself, even if it is limited to customization within a pre-defined solution space. By

contrast, the benefit of mass customization for lead users, with regards to the actual product, needs to be further analyzed as I was unable to identify any significant increase in perceived preference fit for lead users. This requires further investigation of the intersection of these two research streams.

7.2.3 Contribution to consumer research

In terms of consumer research, I add to the understanding of consumer choice behavior. I extend research on the construction of consumers' preferences (Slovic, 1995, Bettman et al., 1998, Yoon and Simonson, 2008) by showing that consumers' preferences can be manipulated and simultaneously steered in opposing directions – towards least frequently chosen options as well as towards most frequently chosen options. My research indicates that the direction of this shift in preferences depends on the product characteristics. Building upon research by Chernev (2004) and Chitturi et al. (2007, 2008), I showed that this diverging choice behavior can be related to both hedonic and utilitarian attributes of products (Batra and Ahtola, 1990, Voss et al., 2003). By demonstrating a relationship between utilitarian attributes and the preference for popular options, as well as a connection between hedonic attributes and the preference for unique options, I establish two new links that have not been identified in existing consumer research. The recognition of existence of these links contributes to the understanding of the nature of consumers' preferences. My findings also serve to highlight the importance of close examination of the characteristics of choice sets used in research in this field.

In addition to this, I contribute to the discussion about choice overload in consumer decision making (Iyengar and Lepper, 2000, Gourville and Soman, 2005, Kuksov and Villas-Boas, 2010, Scheibehenne et al., 2010). In line with Iyengar and Lepper (2000), I validate the existence of choice overload in a real purchase environment, which emphasizes the importance of further understanding this phenomenon and of identifying its causes and contributing factors. My thesis showed that one significant determinant of choice overload is rooted in consumers' personality, or, more precisely, in their tendency to experience difficulties in decision making and to regret their choices. These traits appear to significantly increase perceived choice overload for consumers. My consequent proposition of a differentiated perspective on choice overload, incorporating consumers' personality, thus extends existing research

on the determinants of choice overload (Gourville and Soman, 2005, Haynes, 2009, Amit and Sagiv, 2013).

7.2.4 Contribution to research on social psychology

Finally, my dissertation offers implications for social psychology. A central focus of my dissertation was the investigation of the interaction of two conflicting human needs: the need for uniqueness as opposed to the need for conformity. Prior research theorized the coexistence of these two needs (Snyder and Fromkin, 1980, Brewer, 1991). I validate that individuals indeed seek both uniqueness and conformity, whereby I contribute to the empirical validation of this only recently proposed and still evolving theory (Ruvio, 2008, Imhoff and Erb, 2009, Hirschman, Belk, and Ruvio, 2014). In close relation to this, my experiments also add to research into social influences on individuals' decisions (Cialdini and Goldstein, 2004, Zhu and Huberman, 2014), by showing that information about the behavior of others causes individuals to both adapt to and dissociate themselves from others depending on the choice situation.

Furthermore, by showing that maximization and regret have opposite effects on the perceived fit and on cognitive overload, I contribute to research on maximizing consumers (Schwartz et al., 2002, Nenkov et al., 2008, Giacopelli et al., 2013). This adds to the controversial discussion about the multidimensionality of maximization (Highhouse et al., 2008, Lai, 2010, Rim et al., 2011), by providing empirical validation that maximization involves at least two different facets. The final scale for measuring maximization used in this thesis primarily referred to the high standards dimension and showed completely different effects to the regret scale. While maximizers with high standards felt less overloaded by the variety in mass customization, regret significantly increased the perceived overload. In line with Lai (2010), I therefore suggest a differentiated perspective to maximization for future research in this field; an approach in which high standards on the one hand and regret as well as decision making difficulty on the other, are distinguished from one another.

7.3 Directions for future research

Complimentary to the specific limitations and opportunities for future research that have been highlighted individually for each part of my thesis, I would like to offer some more overarching areas for future research.

Firstly, consumers' decision-making process during customization must be further investigated. With this dissertation I have begun to shed light on consumers' behavior during customization and have identified a tendency of consumers to conform to others. As this is in opposition to the original assumption that consumers' needs are heterogeneous for mass customization (Salvador et al., 2009), further investigation and external validation of this choice behavior is extremely important. In part I of my thesis I identified extraverted consumers to be more interested in customizing products. According to Roccas et al. (2002), this personality trait is negatively correlated with a person's tendency for conformity. Considering this, it is plausible that in real customization contexts, the observed conforming behavior in utilitarian attributes might be weaker whereas the identified preference for unique options might be stronger. Therefore, external validation of my findings from part II would be a valuable extension of my dissertation. Moreover, it would be highly interesting from a psychological as well as managerial point of view, to understand when and why consumers decide to abort the customization process and how this step may be avoided. My findings indicate that different mechanisms may be involved in this. Some consumers may feel overloaded and anticipate regret whereas others may be unable to find a satisfactory configuration due to limitations of the solution space. These findings could be used as basis for controlled experiments with the aim to detect the mechanisms that cause consumers to abort customization.

Secondly, future research should further elaborate on the influence of individual differences in mass customization. For example, my findings with regards to choice overload could be extended by integrating research on decision support systems in mass customization. According to Hildebrand et al. (2012: p.1019), complexity can be reduced by introducing a two-step model of customization and supplying users of MC toolkits with *"pre-specified prototypes"*. As I found choice overload in mass customization to depend on consumers' personality, it would be informative to assess whether and by which types of support systems the negative effect of choice overload can be reduced for indecisive or regretful users. In close relation to this, recent research found

contradictory effects in terms of feedback from peers. Whereas Franke et al. (2008) identified that community feedback increases consumers' evaluation of the customized product and positively affects their willingness to purchase the customized product, Hildebrand, Häubl, Herrmann, and Landwehr (2013b) showed that this feedback diminished consumers' creativity and satisfaction with the self-designed product. These contradictory findings may also depend on consumer specific factors in light of my findings that the value of mass customization is affected by consumers' personality and connection with the product. For example, feedback may be helpful for extraverted consumers in order to gain information regarding how the customized product is perceived by others, but it may also reduce the value for regretful consumers as this may increase uncertainty about their choices.

Thirdly, testing additional consequences of the observed effects would be highly relevant. For example, similarly to the observed effect of consumers' perceived preference fit and process enjoyment on purchase likelihood, these factors may also positively affect brand loyalty of consumers (cf. Dick and Basu, 1994, Chaudhuri and Holbrook, 2001, Knox and Walker, 2001). By contrast, cognitive overload may yield the opposite effect and decrease loyalty, as research has shown that perceived ease of use in online shopping environments increases consumers' loyalty (Chiu, Lin, Sun, and Hsu, 2009). Likewise, consequences of consumers' observed shift in preferences from part II of my thesis require further investigation. Consumers, who receive information about the choices of others, may be more likely to purchase their customized product as it allows them to better satisfy their differing needs. As part II of my thesis was limited to identifying this differing choice behavior in a hypothetical purchase setting, testing this finding under real conditions and extending it by measuring the consequences would be highly valuable.

Fourthly, it would be beneficial to assess further boundary conditions for the success of mass customization besides the investigated consumer-specific determinants. Recent contradictory findings on the positive or negative effect of user-designed versus company-designed products on consumers (Schreier, Fuchs, and Dahl, 2012, Fuchs, Prandelli, Schreier, and Dahl, 2013, Nishikawa et al., 2013), indicate that the perceived value of mass customization might be limited to specific industries. My findings from part I support this proposition, as consumers' interest considerably differed across product categories. Therefore, the success of mass customization may also be determined by the characteristics of the industry or the product on offer. Alongside the

aesthetic and functional parameters of the customizable products of offer, general exogenous factors such as the competitive context (Syam, Ruan, and Hess, 2005) or the technological maturity (Raasch, Herstatt, and Lock, 2008) might affect the success of a mass customization strategy. Elaborating on these suggestions would not only advance the theoretical foundations of the MC concept, but would also be of high practical relevance for firms offering mass customization.

Lastly, research on the influence of culture on customization has been sparse so far, despite the perceived value of personalization being strongly dependent on a consumers' cultural orientation (Kramer, Spolter-Weisfeld, and Thakkar, 2007, de Bellis, Hildebrand, Ito, and Herrmann, 2015). In the second part of my thesis, I identified the relevance of both the need for uniqueness and the need for conformity in customization. However, these needs as well as consumers' choice preferences differ between Eastern and Western cultures (Lee et al., 2010, Liang and He, 2012). Consequently, the question arises whether these findings still hold true in other cultural contexts globally. Likewise, the last study I conducted included real users of customization systems in different European countries. I identified significant differences in perceived choice overload between these countries (see appendix B for detailed results). These findings indicate that differences exist even between relatively similar Western cultures, which highlight the need for further research.

7.4 Managerial implications

This dissertation also has important implications for practice. Firstly, I highlighted that mass customization is indeed attractive and provides an increase in value to consumers. However, a differentiated view is necessary. Companies must be aware that mass customization is not a universally applicable approach for all product types and consumers. It is rather an instrument to enhance the perceived value of specific products for a limited group of consumers. Results from this thesis show that consumers only value customization in specific product categories. Consequently, firms that are considering introducing mass customization should first validate if customization of respective products is of interest to their target customers. In particular, highly aesthetic goods such as shoes or apparel and products with a numerous functional parameters such as laptops or automobiles appear to be most suitable for mass customization.

Secondly, it is vital that companies that offer or plan to offer customizable products, understand their customer base. They should pay attention to what types of customers are likely to use their customization system, and what their specific needs may be. This is important as my findings show that mass customization particularly attracts certain types of consumers such as extraverted consumers and those open to new experiences. Thus, companies should be aware that the needs of this group of consumers are different to the needs of other consumer segments. For example, it is likely that the design experience itself (Franke and Schreier, 2010) or the possibility to express themselves with their customized product (Merle et al., 2010), matters more to these types of consumers.

Drawing on this, companies should separate the users of their MC toolkits in order to allow for an ideal satisfaction of the needs of different consumer segments. My findings show that the central value drivers of mass customization depend on consumer-specific determinants; more precisely, they are affected by consumers' personality traits and their domain-specific attributes. Particularly maximizers, lead users, and highly involved consumers seem to benefit more from customization than regular consumers do. Thus, companies should pay particular attention to the needs of these consumer segments. Moreover, they should also challenge the current prevailing view that mass customization is exclusively focused on providing uniqueness to their customers. My experiments show that in specific product attributes the majority of consumers clearly prefer the most popular options over unique ones. Thus, companies should utilize mass customization as an approach to target both kinds of consumers, those who desire uniqueness and those who may have priorities other than uniqueness in customization. According to my findings this is particularly true for products with a high number of utilitarian attributes.

For hedonic attributes, by contrast, companies should be aware of the potential conflict between uniqueness and preference fit. For example, consumers might prefer a specific popular color but still want to have a unique customized product. Although the preference fit was not significantly negatively affected by consumers' change in preferences towards unique options, it might still be sensible to extend the solution space of the customizable product by elements which allow for uniqueness but do not affect consumers' preference fit in the central hedonic attributes. For example, firms could provide similar color options, name tags or logos that can be added to customized

products. This enables customers to achieve a high preference fit by simultaneously fulfilling their need for uniqueness.

Thirdly, based on the segmentation of their customers, companies need to also *customize* their mass customization offers themselves in order to account for the aforementioned variety in consumers' needs. Only then can the expectations of their customers be met by their mass customization system by simultaneously minimizing the risk of potential pitfalls such as choice overload. Companies must find the right balance between complexity and simplicity of the customization on offer. This could be realized by providing different modes of customization that distinguish between simple and complex versions of the product configurator. For example, companies could provide an expert toolkit that allows adjusting a product in every attribute, as well as a rudimentary version that limits consumers' required engagement to the most popular options. Besides reducing the risk of choice overload, this would also help to address consumers' different needs and skill levels. While the expert toolkit addresses the advanced needs of lead users and maximizers, the rudimentary version attracts satisficers and consumers with low involvement who do not want to spend too much time customizing their product. However, the challenge remains for customers, particularly new ones, to select the appropriate toolkit type for themselves. Therefore, companies should give users of their online toolkit additional support prior to customization, for example, by asking them: *"Customizing your [product x] for the first time? Try out our easy-to-use starter toolkit!"* Moreover, companies could utilize decision aids such as recommendation agents (Häubl and Trifts, 2000, Holzwarth, Janiszewski, and Neumann, 2006) and integrate these into the customization process as additional support for consumers. Another idea would be to implement a two-step customization system that provides pre-defined prototypes and reduces complexity for consumers (Hildebrand et al., 2013b).

In addition, companies should consider further potential drawbacks of mass customization. Consumers with a maximizing mindset tend to be less satisfied with their decisions and tend to experience more regret about their decisions (Schwartz et al., 2002), even if these decisions are objectively superior (Iyengar, Wells, and Schwartz, 2006). Thus, satisfaction with the customized product may be diminished for such types of consumers and might even decrease further if consumers are not able to return the customized product. From this, companies should try to minimize their customers' feelings of regret after purchasing the customized good. For example, they could offer flexible return conditions and communicate those to their customers. As results from

part III have revealed that customers are often not aware of the possibility to return their customized product even if it is in place (see section 6.4.5, Figure 35), this consideration is of particular relevance.

Fourthly, the results of my dissertation can be utilized to reduce the complexity that mass customization brings about for companies. Reducing complexity is crucial to the success of a mass customization system (Gilmore and Pine, 1997, Alford et al., 2000). By optimizing the solution space of a configurator, this complexity can be reduced. Based on my findings, variety adds value in hedonic attributes of products as consumers want to differentiate themselves in these attributes. By contrast, consumers appear to demand less variety in utilitarian attributes. Therefore, it is recommended that companies limit the number of options in utilitarian attributes while extending the variety of the hedonic attributes of their customization offer.

Fifthly, my dissertation emphasizes the importance for companies to consider the process-related value that consumers derive from mass customization. Consumers who enjoy the customization process are significantly more likely to buy their self-designed product. Thus, firms should ensure that using their configurator is an enjoyable experience for consumers (see also Schnurr and Scholl-Grissemann, 2015). As well as giving users the possibility to provide feedback on the usability of the toolkit, firms are well advised to track at which point in customization consumers most frequently abort the process in order to identify any design flaws of the toolkit.

Sixthly, companies should consider showing their consumers some kind of *"uniqueness value"* and *"popularity value"* of the customizable product attributes. I have highlighted that consumers' decisions are influenced by two conflicting needs. This conflict can be resolved by customization, as consumers appear to pursue uniqueness in the hedonic attributes and seek conformity in the utilitarian attributes of a product. Companies can effectively utilize this finding and provide information about the popularity of options in order to better balance the demand within hedonic product attributes such as colors, as my findings suggest that this will increase the demand for less frequently selected options. Moreover, consumers with a high need for uniqueness may find it valuable to know which options are really unique. These consumers would therefore profit from knowing from the start which of the attributes transmit uniqueness, which may prevent them from a negative experience after the purchase, e.g., by frequently seeing similar or even the same customized product in public. Vice versa, firms can reduce variance in demand for complex functional attributes by highlighting

the popularity of specific options to their customers. My experiments have shown that this guides consumers' decisions towards these options. Hence, companies can influence the choices of consumers to select those options that also provide the highest benefits for themselves (e.g., that provide the highest margins or that take complexity out of the production process).

Finally, this study provides a marketing-specific implication. Lead users often serve as opinion leaders (Urban and von Hippel, 1988, Morrison et al., 2004) or take on a *"boundary spanning position"* (Kratzer and Lettl, 2008: p. 33) between clusters of consumers. Satisfying their needs to a greater extent, for example, by providing them with a positive purchase experience throughout customization, might help the company to spread information about their mass customization program to other consumers (Kratzer and Lettl, 2009). Thus, companies that offer mass customization should try to attract lead users, even if these consumers use the toolkit only for the sake of enjoying the design experience. One possibility to realize this would be to run design contests where consumers are able to submit their own designs created with the toolkit.

7.5 Conclusion

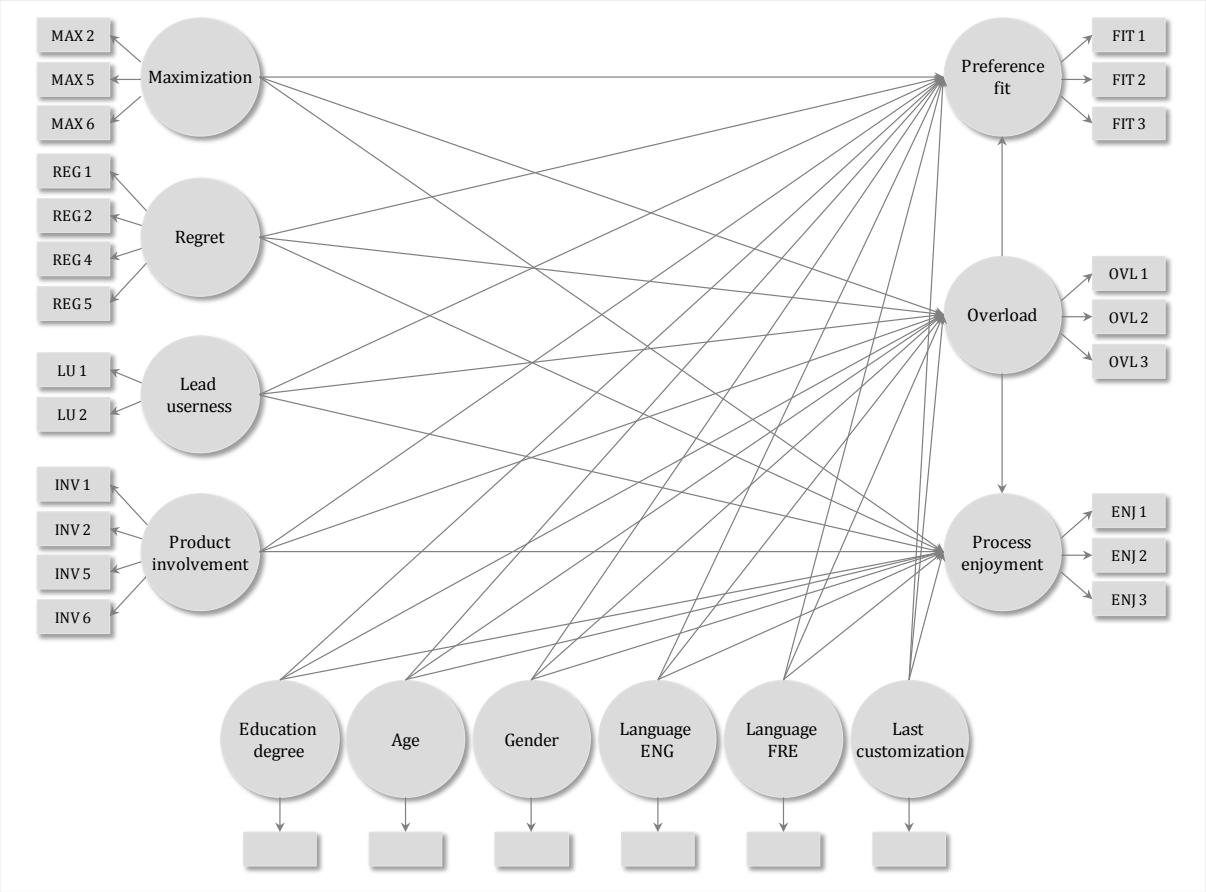
This dissertation examined and elucidated the consumer perspective on mass customization within the scope of the automotive and sports apparel industry. It is based on existing research on mass customization, user innovation, consumer behavior, and social psychology. I contribute to these fields by advancing the understanding of consumers' preferences and their evaluation of customized goods. In particular, I identified that specific determinants affect consumers' interest, their choices, and the perceived value of their customized product. These determinants comprise personality characteristics and domain-specific consumer attributes, which vary between individuals, as well as product-specific properties, which depend on the configurator's solution space and the customizable product itself. Results of this thesis also imply that a differentiated view on choice overload is required depending on the personality of consumers. Mass customization appears to be a way to reduce this overload for certain types of consumers. In general, my findings indicate that the value of a firm's mass customization system is contingent on the characteristics of its customers and the customizable products.

These results undoubtedly require future research. It would be extremely beneficial to further understand consumer behavior during the customization process. My findings indicate that consumers' preferences are unstable during customization and can thus be manipulated by external factors. Further elucidating the factors that cause abortion of customization would be of particular relevance. It is also necessary to investigate the consequences and potential moderating variables of the effects that have been identified in this thesis. Understanding the influence of individual differences should receive particular attention in light of recent research on the different possible modes of customization. Finally, this thesis was limited to the assessment of the boundary conditions of mass customization from the perspective of consumers. Therefore, future research in this field would benefit from a more in depth examination of further external factors that may co-determine the value of mass customization. For example, the value of mass customization may depend on certain industry characteristics such as the competitive environment or technological maturity.

To conclude, mass customization appears to be an auspicious business approach for companies to better satisfy the needs of individual customers. However, it needs to be *customized* itself to accommodate different consumer segments and product characteristics in order to maximize the value for consumers and firms.

8 Appendix

Appendix A: Overview on structural model including control variables (chapter 6)



Appendix B: Results of structural model including control variables (chapter 6)

Path	Path coefficient ß	T-value
Age -> Overload	-0.028	0.734
Age -> PreferenceFit	-0.076	2.064
Age -> ProcessEnjoyment	-0.059	1.441
Education -> Overload	0.049	1.472
Education -> PreferenceFit	-0.143	4.403
Education -> ProcessEnjoyment	-0.102	3.178
Gender -> Overload	-0.062	1.888
Gender -> PreferenceFit	0.027	0.921
Gender -> ProcessEnjoyment	0.029	1.144
ProductInvolvement -> Overload	-0.036	1.002
ProductInvolvement -> PreferenceFit	0.159	3.790
ProductInvolvement -> ProcessEnjoyment	0.242	6.548
LanguageENG -> Overload	0.192	4.918
LanguageENG -> PreferenceFit	0.028	0.263
LanguageENG -> ProcessEnjoyment	0.095	1.662
LanguageFRE -> Overload	0.199	4.724
LanguageFRE -> PreferenceFit	0.035	0.372
LanguageFRE -> ProcessEnjoyment	0.132	2.550
DateofCustomization -> Overload	-0.027	0.797
DateofCustomization -> PreferenceFit	0.059	1.642
DateofCustomization -> ProcessEnjoyment	0.084	2.464
LeadUserness -> Overload	-0.047	1.183
LeadUserness -> PreferenceFit	0.057	1.552
LeadUserness -> ProcessEnjoyment	0.094	2.860
Maximization -> Overload	-0.084	1.927
Maximization -> PreferenceFit	0.124	3.387
Maximization -> ProcessEnjoyment	0.093	2.884
Overload -> PreferenceFit	-0.089	2.076
Overload -> ProcessEnjoyment	-0.144	3.757
Regret -> Overload	0.273	7.313
Regret -> PreferenceFit	-0.068	2.648
Regret -> ProcessEnjoyment	-0.028	1.892

n = 801

Appendix C: Customer survey (anonymized English version; chapter 6)

Survey page 1: Experience with customization

Do you know what [name of company's customization system] is?

- o An account for this company's websites that I can create to access content, promotions or check out faster
- o A service this company provides to track my sport activity like distance and run time
- o A collection of products with customizable colors, materials and performance options for my sport or style
- o I don't know

Product customization allows customers to personalize products according to their own preferences, e.g. by choosing their preferred colors or functional features (see example above).
What is your general experience with product customization?

	1 – strongly disagree	2	3	4	5	6	7 – strongly agree
I'm familiar with product customization.	o	o	o	o	o	o	o
I often customize products.	o	o	o	o	o	o	o
I'm experienced in customizing products.	o	o	o	o	o	o	o

Have you ever customized a product with this company's customization system? (Subsequent survey structure depends on selection)

No, I have never used it.	Yes, I tried it but didn't make a purchase.	Yes, and I purchased one or more products of this system.
o (A)	o (B)	o (C)

Survey page 2A: Reasons for not using this company's customization system (A only – next page: 7A+B+C)

What is your general interest in customizing products of this company?

1 – not interested at all	2	3	4 – moderately interested	5	6	7 – very interested
o	o	o	o	o	o	o

Which athletic footwear/apparel would you be interested in customizing? [multiple choice]

- o Sports shoes
- o Casual shoes
- o T-shirts
- o Hoodies
- o Shorts
- o Bags
- o Other: _____

For me, athletic footwear/apparel**...**

	1 – not at all	2	3	4 – somewhat	5	6	7 – to a very high extent
… are important	o	o	o	o	o	o	o
… matter to me	o	o	o	o	o	o	o
… are useless	o	o	o	o	o	o	o
… are not needed	o	o	o	o	o	o	o
… are essential	o	o	o	o	o	o	o
… are boring	o	o	o	o	o	o	o

With regards to sports goods, please rank the statements listed below according to their importance for you, from 1=most important to 5=least important: [drop down: rank 1-5]

- Having the perfect athletic footwear/apparel which optimally fit my needs.
- Having a unique design of my athletic footwear/apparel.
- Being able to express my identity with my athletic footwear/apparel.
- Feeling like I am the designer of my athletic footwear/apparel.
- Enjoying the purchase experience of my athletic footwear/apparel.

What are the reasons why you've never used company's customization system? [multiple choice]

- I was not aware of this company's customization system.
- I'm not interested in customizing company's products.
- Products of this company's customization system are too expensive compared to non-customizable ones.
- I'm unsure about my design skills.
- Customizing a product is too complicated.
- The delivery time is too long.
- I don't know how to return the customized product.
- I don't want to purchase a product without touching it.
- Other: _____

Please indicate the most important reason why you've never used this company's customization system:

- Most important: [drop down: reasons]

What is the likelihood that you will purchase a customized product from this company in the future?

1 – very unlikely	2	3	4	5	6	7 – very likely
o	o	o	o	o	o	o

Survey page 2B: Past customization activity (B only – next page: 3B+C)

How many products did you customize with this company's customization system?

1	2	3	4	5	More than 5
o	o	o	o	o	o

When did you last customize a product with this company's customization system? [drop down]

- o 2012 or earlier
- o Jan-Mar 2013
- o Apr-Jun 2013
- o Jul-Sep 2013
- o Oct-Dec 2013
- o Jan-Mar 2014
- o Apr-Jun 2014
- o Jul-Sep 2014
- o Oct-Dec 2014

Survey page 2C: Past customization activity (C only – next page: 3B+C)

How many customized products did you purchase from this company's customization system?

1	2	3	4	5	More than 5
o	o	o	o	o	o

When did you last purchase a customized product from this company's customization system? [drop down]

- o 2012 or earlier
- o Jan-Mar 2013
- o Apr-Jun 2013
- o Jul-Sep 2013
- o Oct-Dec 2013
- o Jan-Mar 2014
- o Apr-Jun 2014
- o Jul-Sep 2014
- o Oct-Dec 2014

Survey page 3B+C: Details on customization activity (B+C only – next page: 4B+C)

Please refer all of the following questions to your last product you customized with this company's customization system.
Which type of product did you customize? [= Q*]

- o football boots
- o running shoes
- o casual sneakers
- o basketball shoes
- o training shoes
- o tennis shoes
- o golf shoes
- o skateboarding shoes
- o American Football shoes
- o t-shirt
- o bag

Did you share your design with others? [yes/no]

If yes, how did you share it? [multiple choice]

- o with individuals (e.g. family or close friends)
- o on social media (Facebook, Twitter, etc.)

If you shared your design, did you apply any changes as a result of sharing it?

No changes at all	Some changes	A lot of changes
o	o	o

Did you use one of the featured designs when you customized this product?

- o I didn't notice them.
- o I noticed them but didn't use any for my own design.
- o I used one of them and applied a lot of changes.
- o I used one of them and applied some changes.
- o I used one of them and applied no changes.

Overall, how satisfied are you with your final design?

1 – very unsatisfied	2	3	4 – neither satisfied nor unsatisfied	5	6	7 – very satisfied
o	o	o	o	o	o	o

To what extent has your final design fallen short of or exceeded your expectations?

1 – strongly fell short of my expectations	2	3	4 – exactly met my expectations	5	6	7 – strongly exceeded my expectations
o	o	o	o	o	o	o

Survey page 4B+C: Perception of customization (B+C only – next page: 5B/5C)

How do you perceive your customized [Q*]?

	1 – strongly disagree	2	3	4	5	6	7 – strongly agree
This product design is exactly what I had hoped for.	o	o	o	o	o	o	o
I could create the product that provided the best fit to what I was looking for.	o	o	o	o	o	o	o
I could create the product I really wanted to have.	o	o	o	o	o	o	o
With this product design, I will not look like everybody else.	o	o	o	o	o	o	o
I could design a product that others will not have.	o	o	o	o	o	o	o
With this product, I have a small element of differentiation compared to others.	o	o	o	o	o	o	o
I could create a product that is almost like me.	o	o	o	o	o	o	o
This product design reflects exactly who I am.	o	o	o	o	o	o	o
This product design expresses my identity.	o	o	o	o	o	o	o

How did you perceive the design activity of your [Q*]?

	1 – strongly disagree	2	3	4	5	6	7 – strongly agree
It was fun to customize this product.	o	o	o	o	o	o	o
I really enjoyed creating this product.	o	o	o	o	o	o	o
Customizing this product was a real pleasure.	o	o	o	o	o	o	o
This company gave me a lot of autonomy in the creation of this product, and I really enjoyed it.	o	o	o	o	o	o	o
I could give my creativity free rein while designing this product.	o	o	o	o	o	o	o
Designing this product was exhausting.	o	o	o	o	o	o	o
Designing this product was time-consuming.	o	o	o	o	o	o	o
It was difficult to find a satisfactory design for my product due to the amount of options.	o	o	o	o	o	o	o
The huge range of options made it difficult to maintain an overview.	o	o	o	o	o	o	o
It was very hard to decide on a product design due to the various possibilities from which one can choose.	o	o	o	o	o	o	o
I feel grateful to this company for enabling me to design my own product.	o	o	o	o	o	o	o
I feel thankful to this company for enabling me to design my own product.	o	o	o	o	o	o	o
I feel appreciative to this company for enabling me to design my own product.	o	o	o	o	o	o	o

To which degree do you think your [Q*] is/are …

	1 – not at all	2	3	4 – somewhat	5	6	7 – to a very high extent
… unusual?	o	o	o	o	o	o	o
… original?	o	o	o	o	o	o	o
… new?	o	o	o	o	o	o	o

How user friendly would you rate this company's customization system?

	1 – strongly disagree	2	3	4	5	6	7 – strongly agree
It's fast and easy to use.	o	o	o	o	o	o	o
It's designed attractively.	o	o	o	o	o	o	o
It's clearly arranged.	o	o	o	o	o	o	o

Survey page 5B: Reasons for non-purchase (B only – next page: 6A+B+C)

What prevented you from purchasing your customized [Q*]? [multiple choice]

- o It was too expensive compared to other non-customizable products.
- o There were not enough customization options.
- o There wasn't enough product information.
- o I was unsure about my own design.
- o The purchasing process was too complicated.
- o The delivery time was too long.
- o I didn't know how to return the customized product.
- o I didn't want to purchase this product without touching it.
- o Other: _____

Please indicate the most important reason why you did not purchase your customized [Q*]:

- o Most important: [drop down: reasons]

What is the likelihood that you will purchase a customized product from this company in the future?

1 – very unlikely	2	3	4	5	6	7 – very likely
o	o	o	o	o	o	o

How many times per week do you use (a) [Q*]?

Less than once	1x	2x	3x	4x	5x or more
o	o	o	o	o	o

For me, (a) [Q*]...

	1 – not at all	2	3	4 – somewhat	5	6	7 – to a very high extent
… is/are important	o	o	o	o	o	o	o
… matter(s) to me	o	o	o	o	o	o	o
… is/are useless	o	o	o	o	o	o	o
… is/are not needed	o	o	o	o	o	o	o
… is/are essential	o	o	o	o	o	o	o
… is/are boring	o	o	o	o	o	o	o

With regards to (a) [Q*] in general, please rank the statements listed below according to the importance for you, from 1=most important to 5=least important: [drop down: rank 1-5]

- Having the perfect product which optimally fits my needs.
- Having a unique design of this product.
- Being able to express my identity with this product.
- Feeling like I am the designer of this product.
- Enjoying the purchase experience.

Survey page 5C: Additional questions for buyers (C only – next page: 6A+B+C)

What is the likelihood that you will purchase a customized product from this company in the future?

1 – very unlikely	2	3	4	5	6	7 – very likely
o	o	o	o	o	o	o

How did you perceive the delivery time of your customized product?

1 – very negative	2	3	4 - adequate	5	6	7 – very positive
o	o	o	o	o	o	o

How many times per week do you use (a) [Q*]?

Less than once	1x	2x	3x	4x	5x or more
o	o	o	o	o	o

For me, (a) [Q*]...

	1 – not at all	2	3	4 – somewhat	5	6	7 – to a very high extent
… is/are important	o	o	o	o	o	o	o
… matter(s) to me	o	o	o	o	o	o	o
… is/are useless	o	o	o	o	o	o	o
… is/are not needed	o	o	o	o	o	o	o
… is/are essential	o	o	o	o	o	o	o
… is/are boring	o	o	o	o	o	o	o

With regards to (a) [Q*] in general, please rank the statements listed below according to the importance for you, from 1=most important to 5=least important: [drop down: rank 1-5]

- Having the perfect product which optimally fits my needs.
- Having a unique design of this product.
- Being able to express my identity with this product.
- Feeling like I am the designer of this product.
- Enjoying the purchase experience.

Survey page 6A+B+C: Personal characteristics (next page: 7A+B+C)

Please indicate which statements apply to you.

	1 – strongly disagree	2	3	4	5	6	7 – strongly agree
When I'm in the car listening to the radio, I often check other stations to see if something better is playing, even if I'm relatively satisfied with what I'm listening to.	o	o	o	o	o	o	o
No matter how satisfied I am with my job, it's only right for me to be on the lookout for better opportunities.	o	o	o	o	o	o	o
I often find it difficult to shop for a gift for a friend.	o	o	o	o	o	o	o
Renting movies is really difficult. I'm always struggling to pick the best one.	o	o	o	o	o	o	o
No matter what I do, I have the highest standards for myself.	o	o	o	o	o	o	o
I never settle for second best.	o	o	o	o	o	o	o

	1 – strongly disagree	2	3	4	5	6	7 – strongly agree
Whenever I make a choice, I'm curious about what would have happened if I had chosen differently.	o	o	o	o	o	o	o
Whenever I make a choice, I try to get information about how the other alternatives turned out.	o	o	o	o	o	o	o
Once I make a decision, I don't look back.	o	o	o	o	o	o	o
If I make a choice and it turns out well, I still feel like something of a failure if I find out that another choice would have turned out better.	o	o	o	o	o	o	o
When I think about how I'm doing in life, I often assess opportunities I have passed up.	o	o	o	o	o	o	o

	1 – strongly disagree	2	3	4	5	6	7 – strongly agree
I usually find out about new sports goods earlier than others.	o	o	o	o	o	o	o
I have benefited significantly by early adoption and use of new sports goods.	o	o	o	o	o	o	o
I have tested prototype versions of new sports goods for manufacturers.	o	o	o	o	o	o	o
I often try to avoid products or brands when I know that the average population purchases them.	o	o	o	o	o	o	o
When I purchase a product, it is important for me to find something which communicates my uniqueness.	o	o	o	o	o	o	o
When products or brands I like become very popular, I lose interest in them.	o	o	o	o	o	o	o

Survey page 7A+B+C: Descriptive statistics

Which of the criteria listed below is the most and least important for you?

	Low price of customized products	High number of available product customization options	Quicker delivery of customized products
Most important	o	o	o
Least important	o	o	o

What do you think about this company as a brand?

	1 – strongly disagree	2	3	4	5	6	7 – strongly agree
I will choose this company the next time I purchase athletic footwear/sports apparel.	o	o	o	o	o	o	o
I will continue to be a customer of this company.	o	o	o	o	o	o	o
I'm committed to this company.	o	o	o	o	o	o	o
I would be willing to pay a higher price for this company's brand over other brands.	o	o	o	o	o	o	o

Please indicate your gender. [drop down: male, female, no answer]

Please indicate your age. [text box]

Please indicate your highest educational degree.

None	Less than high school	High school (A-levels)	Bachelor's degree or equivalent degree	Master's degree or equivalent or higher degree	No answer
o	o	o	o	o	o

Please indicate your country of origin. [drop down]

Please indicate your monthly net income.

up to £500	£500 - 999	£1,000 - 1,999	£2,000 - 4,000	over £4,000	No answer
o	o	o	o	o	o

What amount do you approximately spend on sports goods (shoes and clothing) per year?

up to £200	£200 - 499	£500 - 1000	over £1,000	No answer
o	o	o	o	o

Enter your e-mail address in the text field below for a chance to win a pair of customized shoes of your choice. [text box]

Please feel free to share any comments on the survey or this company in the text field below. [text box]

Thank you for completing the survey!

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