RESEARCH

Stefan R. Thallmaier

Customer Co-Design

A Study in the Mass Customization Industry

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Change of institutions, technology and competition drives the interplay of markets and organisations. The scientific series 'Markets and Organisations' addresses a magnitude of related questions, presents theoretic and empirical findings and discusses related concepts and models.

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Customer Co-Design

A Study in the Mass Customization Industry

With a foreword by Prof. Dr. Kathrin M. Möslein

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Leipzig, Germany

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For All Co-Designers

Foreword

Mass customizers across all product categories continuously strive to increase attractiveness of their co-design interfaces to keep ahead of their competition and increase sales. Recent studies even show that the industry is continuously growing especially driven by numerous start-ups with technological advances and new digital toolkits at the customer interface. However with the increasing proliferation of service channels and digital media at the customer interface, the need arises to better understand how these channels and media may be coordinated to increase customer value perception along the co-design process. Stefan Thallmaier addresses this challenge and his thesis provides convincing and well-founded answers. Based on multiple empirical studies he invites the reader to

- identify the key challenges for increasing the value perception of customers in the co-design process with digital media,
- differentiate online co-design interfaces according to their interaction features and dominant approaches for social co-design activities, and
- to understand the relevance of creative achievement in online customer co-design and the potential of live help.

Stefan Thallmaier empirically derives that customer value perception profits from varying levels of social presence in the co-design process. Higher social presence fosters discovery and facilitates reinforcement. Lower social presence in contrast strengthens the feeling of creative achievement. Stefan Thallmaier's thesis has been accepted as doctoral dissertation in 2014 at the HHL Leipzig Graduate School of Management. It is comprehensive in its approach and reveals interesting insights for researchers and practitioners alike to better understand the process of customer co-design in mass customization. The work equally appeals by its academic scope and practical reach. It covers relevant examples from practice, which help the reader to follow the argumentation with ease and delivers useful recommendations how to adapt co-design interfaces in order to increase attractiveness. I congratulate Stefan Thallmaier on the tangible and convincing results of his research. The book is a must read for all those who have an interest in customer co-design far beyond the boundaries of the mass customization industry. I wish the book the broad dissemination it deserves and Stefan Thallmaier all the best for his future career.

Prof. Dr. Kathrin M. Möslein

Acknowledgement

This book originated from my research activities at the Center for Leading Innovation and Cooperation in Leipzig. While preparing and authoring this piece of work, I have received the support of several people.

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Forth, I am indebted to my family, foremost my parents Gabi and Peter and my brother Michael. They believed in me all the time - and yes, the final result doesn't look that complicated, but the development is. Thank you for backing me up, whenever I needed it.

Finally there is my love Leni. My deepest appreciation goes to her as she encouraged me to proceed in this arduous work. I owe her so much more than only these two simple words THANK YOU. Probably it is easier for me to use the other three words: I LOVE YOU.

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List of Abbreviations

3D	Three-Dimensional
AG	Aktiengesellschaft
AVE	Average Variance Extracted
BMBF	Bundesministerium für Bildung und Forschung
CEO	Chief Executive Officer
CR	Composite Reliability
e.g.	for example (Latin: exempli gratia)
et al.	et alii
etc.	et cetera
FL	Standardized Factor Loading
i.e.	for example (Latin: id est)
IP	Intellectual Property
IR	Indicator Reliability
KUMAC	Kunden als Wertschöpfungspartner bei Mass Customization Leistungen
LISREL	Linear Structural Relations
MC	Mass Customization
MGA-PLS	Multi-Group Analysis for Partial Least Squares
p.	page
pp.	pages
PLS	Partial Least Squares
QDA	Qualitative Data Analysis
SME	Structural Equation Modeling
URL	Uniform Resource Locator
VHB	Verband der Hochschullehrer für Betriebswirtschaft e.V.

Part I – Introduction

1 Relevance of Customer Co-Design

*"Very few organizations make **customer co-design** a core competency –*
the starting point for all new business initiatives.
Yet this doesn't make sense."

– Patricia B. Seybold[1]

As indicated with the introductory citation above, it is frequently recognized that *customer co-design* plays a major role in managing business initiatives successfully.[2] It ensures that products or services are designed through the customer's eyes. This perspective is expected to increase the likelihood of customer needs being met more accurately with co-design than with conventional design processes, which are predominantly operated from a business perspective. Thereby *customer co-design* denotes the process of creative interaction between a customer and a business to develop a specification for a product or service, which is denoted *design*. In line with Sanders (2008), co-design thereby refers

"to the creativity of designers and people [e.g. customers] not trained in design working together in the design development process."[3]

Many leading experts and thinkers in the domain of business propose manifold concepts of how to incorporate the customer's perspective into business strategies in order to establish a new or maintain an existent competitive advantage.[4] Thereby it may be stated that customer co-design follows the idea of *interactive value creation*, which suggests new forms of customer participation in the value creation processes of businesses. Reichwald and Piller (2009) state that, through *customer co-design*,

"processes of value creation, which were formerly dominated from a business perspective, turn into processes of interactive value creation through an active role of the customer."[5]

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[1] Seybold (2006, p. 6)

[2] Piller and Möslein (2002); Tseng and Piller (2003a); Franke and Piller (2003); Piller and Berger (2003); Berger, Möslein, Piller and Reichwald (2005); Seybold (2006); Reichwald and Piller (2009); Son, Sadachar, Manchiraju, Fiore and Niehm (2012)

[3] Sanders and Stappers (2008, p. 6)

[4] Normann and Ramírez (1993); Hippel (1994); Prahalad and Ramaswamy (2004); Benkler (2006); Tapscott and Williams (2007); Howe (2008)

[5] Reichwald and Piller (2009, p. 41), translated by the author

One prominent business strategy which applies customer co-design as one distinctive principle is *mass customization.*[6] This business strategy intends to respond to the growing consumer demand for individualization at a reasonable price level which is close to non-customized (i.e. pre-designed) products. Thus in contrast to pure customization strategies, which intend to provide products in small niche markets, mass customizers intend to operate in relatively large markets or a collection of niche markets.[7] A remarkable example of such a business is the mi adidas program offered by the sport manufacturer adidas.[8] The core idea is to manufacture consumer goods – in the case of adidas, sport shoes - which are customized to the specific needs of every single customer, while orienting towards the cost efficiency of traditional mass production concepts. To achieve this, the business needs to operate a cost efficient interaction system which enables customers to engage in a co-design process with the business. The process yields a design specification, which is then translated into a product by the manufacturer. After production, the customer receives the custom product for his personal use at a fair price. Through the possibility of individualization, mass customizers intend to gain a competitive advantage within their respective markets. Besides, mass customized products are expected to yield a price premium, i.e. an increased willingness to pay more compared to a non-customized product.[9] Seybold (2006) states that

> *"…customers who self-configure their own products tend to spend 20 to 30 percent more than customers who purchase off-the-shelf solutions."*[10]

Two examples from the mass customization industry are depicted in the following to provide an idea how the process of *customer co-design* may appear. These examples are Spreadshirt, a mass customizer for apparel, and selve, a provider for individualized shoes. In each example, the process of customer co-design is briefly introduced and illuminated.

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[6] Pine (1992); Piller (2000)

[7] McCarthy (2004); For a definition of pure customization refer to Lampel and Mintzberg (1996) or Blecker and Abdelkafi (2006).

[8] Piller and Berger (2003) and www.adidas.de/personalisieren

[9] Piller, Möslein and Stotko (2004)

[10] Seybold (2006, p. 272)

The business of Spreadshirt focuses on the online channel to provide its customer interface.[11] Figure 1 depicts the online toolkit, which may be applied by users to design their preferred t-shirt or other available apparel. A huge collection of graphics, i.e. designs, and a rich toolbox for text editing is provided to adapt the t-shirt. Meanwhile, spreadshirt has established a well working eco-system around its sophisticated customer interface, where users may choose from a wide selection of pre-designed t-shirts.
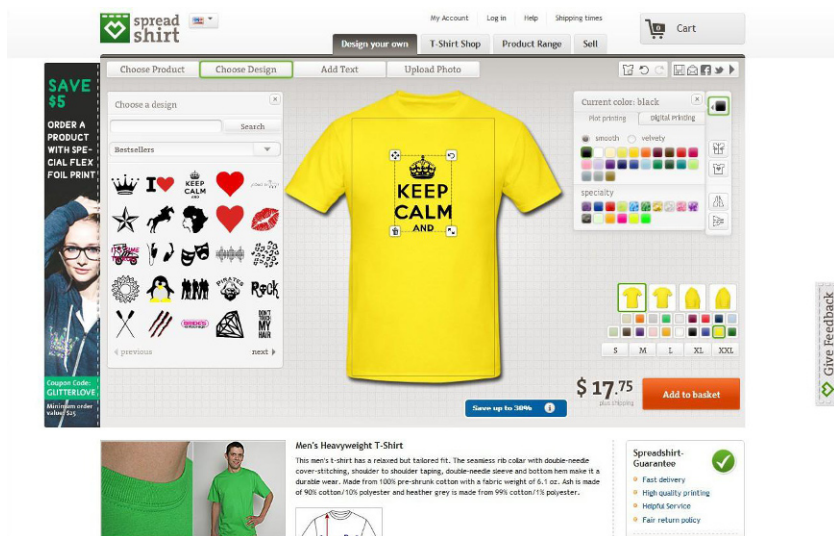
Figure 1: Online interface of Spreadshirt showing the toolkit to design a t-shirt[12]

Selve, in contrast, predominantly provides its co-design process in-store. Figure 2 depicts a photograph of a co-design session with two prospective customers, i.e. on the right-hand side, and one design professional from selve on the left-hand side. Based upon prior appointments, customers and design professionals meet in-store in a showroom and together explore the product solution space for individually designed shoes in terms of shapes, material, colors and sizes. In this process, which typically lasts 45 minutes to 1 hour, customers may feel and touch shoe samples. The co-design process is further supported via a tablet and the online toolkit available.

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[11] Thallmaier and Straßburger (2010)

[12] Screenshot retrieved on January 23, 2013 from www.spreadshirt.de

Figure 2: One employee and two customers designing shoe within selve showroom[13]

However, besides the aforementioned examples, several remarkable failures such as Levi Strauss's *Original Spin* or Mattel's *My Design Barbie* have delivered practical refutations to the strategy of mass customization.[14] Thus, until today, the success of the concept remains unclear. Salvador et al. (2009) for example conclude:

> "*Most companies could benefit from mass customization, yet few do.*"[15]

Scholars attribute this fact, inter alia, to a deficient understanding of the business strategy as a whole. One specific point of criticism is the inherent process of *customer co-design*, which is necessary to provide every single customer with a customized product which best fits his personal preferences. As Franke et al. (2009) note

> "*scholars have questioned the merits of customization because it requires extensive customer participation.*"[16]

One of the problems with mass customizers is the potential for *mass confusion*.[17] It is argued that consumers typically say that they to prefer more choice over less. However, at the point in time when they need to choose from a variety of product design alternatives, they may get confused and feel uncomfortable, because of the

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[13] Photograph taken on January 11, 2013 within selve showroom

[14] Salvador, de Holan and Piller (2009)

[15] Salvador et al. (2009, p. 71)

[16] Franke, Keinz and Steger (2009)

[17] Huffman and Kahn (1998)

sheer amount of options. The dilemma is that providing more options may actually lead to less satisfaction. Besides that, operational efficiency from a business perspective is addressed as a core problem of customer co-design in the mass customization industry.

> *"Whether the elicitation stage is performed in a retail setting, or solely on the Internet, efficient information handling systems are the pin-points leveraging MC."* [18]

In this context, mass customization businesses with online toolkits, comparable to the previously introduced interface from Spreadshirt, have received much attention in the literature.[19] Studies so far have concentrated on electronic co-design services and the questions of how to optimize the online experience in order to increase customer attraction and conversion efficiency. Hence these investigations predominantly focus on the appearance of websites, toolkit usability or user experience. Here it is frequently argued that online mass customizers need to find a balance between the appropriate level of utility, e.g. increasing the preference fit, and complexity, e.g. offering too many choices.[20] However, researchers and practitioners realize that certain customers need more support to carry out creative design activities, as they are usually not trained for that kind of task.[21] The need for human assistance in designing a product is not adequately met by these online interfaces, unlike in physical stores where design professionals may advise the customers in real time, as Zou (2007) indicates:

> *"However, many customers have criticized these automated online systems, calling them impersonal and time consuming in trying to locate the information they want."* [22]

To solve this problem, researchers are considering complementing online co-design processes with additional service channels and digital media, e.g. community features, or with feedback mechanisms which are actually known from physical stores, e.g. through direct contact with sales personnel.[23] Physical stores in contrast profit from the fact that direct real-time contact with design professionals is

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[18] Piller and Berger (2003, p. 44)

[19] Müller (2007)

[20] Dellaert and Stremersch (2005)

[21] Salvador et al. (2009)

[22] Zou (2007, p. 1)

[23] Dellaert and Dabholkar (2009); Franke, Keinz and Schreier (2008); Turner, Merle and Diochon (2012);

possible. However, it is argued that in-store co-design processes are less efficient than online co-design processes. Lee and Chang (2011) even emphasize that the

> "use of the Internet is considered necessary in customizing products in that it has allowed effective and spontaneous communication between company and consumer"[24]

Inarguably, co-designing products within physical stores or online may differ significantly in terms of customer experience, even when the same product is purchased.[25] Each service channel however exhibits certain strengths and weaknesses for performing co-design processes. The problem that remains is how to combine these strengths and outweigh potential deficits to increase customers' value perception. With the increasing proliferation of service channels and new media, more and more promising combinations arise, i.e. in-shop tablet solutions or social toolkits. This development increases the need to understand how these combinations may affect customer co-design.

> "The challenge is to leverage and coordinate the strengths of online and offline channels to increase the overall value for customers."[26]

Following this line of argumentation, the present thesis aims to understand the value each channel or medium may add to the process of customer co-design. Based upon this understanding, mass customizers may adjust or complement their co-design processes to increase customers' value perception. The initial research question thus reads as follows:

> How can mass customizers coordinate the strengths of various service channels and digital media to increase customers' value perception?[27]

This initial research question will be further detailed and clarified in part II with the help of a thorough literature review in the domain of mass customization and the derivation of the theoretical framework. The present thesis will explore customer co-design within the mass customization industry and reveal important findings for researchers and practitioners to add new knowledge in this domain. The remainder of this part is structured as follows. In chapter 2, a definition of customer co-design is introduced and grounded in its initial roots of appearance in academia. Finally, chapter 3 provides an overview of the structure of this thesis with its six parts.

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[24] Lee and Chang (2011, p. 171) based on Anderson (2008); Hibbard (1999); Kim (2002)

[25] Broekhuizen (2006)

[26] Montoya-Weiss, Voss and Grewal (2003)

[27] Refer to part II for the detailed research question and the theoretical framework for the present thesis.

2   Definition of Customer Co-Design

"Designing and developing anything of consequence is incredibly challenging."

– Jonathan Ive

Before diving deeper into customer co-design, it is important to define the concept. In order to do so, the inherent notions of *design* and *co-design* are introduced before a final definition of customer co-design is presented, which will serve as the basis for the entire thesis and its multiple empirical studies in the mass customization industry.

The notion of *design* refers to a specification which contains the fundamental information to construct or execute the desired artifact. This artifact may exhibit a plan for a new service, an object such as a product or a complex system, to deliver entire customer solutions. Another intuitive definition is delivered by Baldwin and Hippel (2011) who state:

> *"A design is a set of instructions that specify how to produce a novel product or service."*[28]

Further, the authors deliver a practical analogy by comparing the concept of design to following a recipe. A cooking recipe typically defines the requirements, i.e. ingredients and instructions, for producing a tasty meal. As noted previously, the notion of *design* may by applied to products, services or even complex systems. Within the mass customization industry, however, the notion of design is mostly to products. The terms *design* or *product design* are frequently used interchangeably. It needs to be noted here that the present thesis follows this stream and focuses on the notion of design as the set of instructions to customize a specific consumer product, i.e. shoes or t-shirts.[29]

Based on the latter understanding, Sanders and Stappers (2008) deliver a good entry point into the development of the co-design concept with their publication on "*Co-Creation and the new landscape of design*".[30] They argue that co-design refers to a process of collective creativity, in which ideas and thoughts are shared between at

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[28] Baldwin and Hippel (2011, p. 9)

[29] Kamali and Loker (2002)

[30] Sanders and Stappers (2008)

least two people to design a product, as previously noted. Co-design therefore can be regarded as a particular instance of the superior concept of co-creation. Co-creation is frequently attributed to the scholars Prahalad and Ramaswamy (2004), who argue that the future of business competition is based on successful processes of co-creation and thus co-design, where customers are provided with unique value.[31] This idea is also closely related to the concept of interactive value creation as it is introduced by Reichwald and Piller (2009).[32] Prahalad and Ramaswamy (2004) state:

> "*The meaning of value and the process of value creation are rapidly shifting from a product and firm-centric view to personalized consumer experiences. Informed, networked, empowered and active consumers are increasingly co-creating value with the firm."*[33]

The roots of co-design are located in the school of participatory design dating back more than 40 years, as Sanders and Stappers (2008) argue.[34] Hence co-design is actually not a new at all. The authors state that already at that time, various researchers recognized the need to combine the know-how of the future users of a product with the expertise of professional designers in order to improve the performance and accuracy of development efforts. The resulting discussion on *user participation in design* or *participatory design* finally led to the concept of co-design, which elaborates on the same basic idea, although the years of ongoing scientific discussion have constantly and slightly changed the facets of the discussion.

Thereby 'co' in the notion of co-design can be interpreted from two perspectives. The first perspective may imply the misleading understanding that two or more designers, i.e. people who are specifically educated in design, collaborate in order to reach a common goal, e.g. a new product design.[35] The second, well-established perspective however, implies the understanding that co-design is a process in which people and users who are not specifically trained in design together with professional designers collectively ideate, develop and create new value. Depending on the applied vocabulary and discipline, the 'co' in co-design is frequently interpreted as being adopted from various different but closely related notion-families beginning with 'co', such as collective, cooperative and collaborative.

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[31] Prahalad and Ramaswamy (2004)

[32] Reichwald and Piller (2009)

[33] Prahalad and Ramaswamy (2004)

[34] Sanders and Stappers (2008, p. 7)

[35] Sanders and Stappers (2008, p. 6)

However, originally it stems from the Latin prefix 'co', which exhibits the meaning of together, mutually or jointly and as such expresses the relation of two subjects, i.e. co-designers, or objects, i.e. co-occurrences.[36]

Having introduced the basic notions of *design* as well as *co-design,* the definition of *customer co-design* can be introduced. Adding the term customer implies the fact that the co-design process is carried out together with the customer who will finally receive and use the result of the co-design process, i.e. the product. The definition is therefore taken from Sampson and Fröhle (2006) who define customers

> "*…as the individuals or entities who determine whether or not the service provider shall be compensated for production*"[37]

This is for example the case in the mass customization industry, where each singular customer enters the co-design process provided by the company to design his own custom product. Hence the customer actually acts as a co-designer of his own product, even though he is not trained as a professional designer. Therefore, taking all these aspects into account, the following definition can be finalized:

> **Definition:** *Customer Co-Design describes a development process in which the customer and provider collectively ideate, elaborate and create a design specification for a product, which is purchased by the customer.*

The latter definition closely relates to the definition as it is stated by Tseng and Piller (2003):

> "*Customer co-design describes a process that allows customers to express their product requirements and carry out product realization processes by mapping the requirements into the physical domain of the product.*"[38]

However, the definition elaborated in the box above includes the facet of creation and thus creativity, which is a fundamental element of co-design activities, as outlined at the beginning of the chapter. Hence on the basis of this definition, the subsequent chapter introduces the entire structure of the thesis and explains its composition.

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[36] Stoller-Schai (2009, p. 34)

[37] Sampson and Fröhle (2006, p. 332)

[38] Tseng and Piller (2003b)

3 Structure of the Thesis

"Style and structure are the essence of a book; great ideas are hogwash."

– Vladimir Nabokov

The present thesis is structured into six *parts* supporting the goal to better understand how various service channels and digital media affect customer co-design in the mass customization industry. The overall structure follows the gradual research process conducted, hence each part represents one specific research step. On the next structural level, every *part* is divided into *chapters*, which - on the lowest hierarchical level - are divided into *sections* and *subsections*.

Part I introduces the relevance of customer co-design, defines the concept and finally presents the structure of the present thesis. Part II elucidates the key concepts, derives the theoretical framework, clarifies the initial research question and subsequently presents the chosen research design. Building upon part I and II, the subsequent parts III, IV and V each lay out an empirical study. Each empirical study covers its own subordinated research questions to explore the answer to the overall research question of the present thesis. To achieve this, each of the three empirical studies builds upon its own theoretical underpinnings, separate data sources, specific method of analysis and an individual discussion of its findings. A structured abstract is available for each of the three empirical studies conducted. It can be found at the beginning of part III, IV and V. The abstracts are structured along the chapters of the succeeding study. Hence they provide the reader with a quick overview of the contents of each study.

Part III explores key challenges of customer co-design, addressing the aspects of *discovery*, *creativity* and *reinforcement* from a customer's perspective across service channels and interaction media. Part IV identifies two dominant approaches, i.e. *social customer co-design* and *live customer co-design,* to overcome the lack of human reinforcement in processes of online customer co-design. Part V investigates the impact of higher social presence through live help services in online customer co-design settings, using a quasi-experimental fields study. The field study indicates the relative importance of creative achievement in online customer co-design and suggests that live help services significantly increases customers' perceived service

quality. Finally, part VI provides a summarizing discussion of the entire research results across the three empirical studies, highlighting valuable insights for practitioners and academics alike. Implications are derived and avenues for further research are presented. Figure 3 depicts the entire structure of this dissertation in a compact visualization. In the following, each of the six parts are outlined in more detail and interrelations are presented.

PART I - Introduction
- Introduces the relevance of customer co-design and provides illustrative examples
- Defines customer co-design based on the underlying concepts and notions
- Depicts the structure of the thesis and briefly presents each singular part

PART II - Theoretical Framework
- Elicits the key concepts of customer co-design in the mass customization industry
- Derives the theoretical framework to guide the empirical research
- Clarifies the sequential exploratory research design employing mixed methods

PART III - Empirical Study 1: Challenges of Customer Co-Design
- Explores challenges of customer co-design across channels and media
- Conducts a comparative exploration of six in-depth case studies
- Identifies three key challenges of customers discovery, creativity and reinforcement

PART IV - Empirical Study 2: Online Customer Co-Design
- Explores characteristics and features of online customer co-design
- Conducts a large-scale cross-case analysis of 115 online mass customizers
- Identifies characteristics and dominant approaches for online customer co-design

PART V - Empirical Study 3: Customer Co-Design & Live Help
- Explores antecedents and consequences of perceived value in online co-design
- Conducts a quasi-experimental field study with 205 participating customers
- Derives the relative importance of creative achievement and benefits of live help

PART VI - Discussion and Conclusion
- Summarizes the empirical research studies and discusses the overall findings
- Derives managerial implications for the practice of customer co-design
- Provides avenues and questions for future research

Figure 3: Hierarchical structure of the thesis with its six parts[39]

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[39] Own illustration

Part I – Introduction

First, part I outlines the relevance of customer co-design within the mass customization industry. Two examples from practice illustrate the process and its context in greater detail. Second, the concept of customer co-design is characterized based on its historical development and is clearly defined as the basis for the subsequent empirical studies. Third, *part I* concludes by depicting the structure of the thesis verbally as well as graphically in a compact visualization.

Part II –Theoretical Framework

Within *part II* the theoretical framework for the present thesis is introduced based upon the elucidation of key concepts. First, the business strategy of *mass customization* is characterized and detailed along its basic principles. Next, the concept of *customers' perceived value* is explained to provide an understanding of how customer may gain value from this business concept. Based on that, the second chapter focuses on the inherent process of *customer co-design* and introduces two fundamental perspectives. One concentrates on the various *stages of interaction* within the entire process, while the other illustrates the bandwidth of potential service *channels and digital media* to support this interaction. Based on those theoretical insights, *part II* finally details the initial research question and derives the theoretical framework for the subsequent empirical studies. Part II finishes with the specification and graphical depiction of the research design chosen for the present thesis.

Part III – Empirical Study 1: Challenges of Customer Co-Design

Part III explores challenges in customer co-design across channels and media with the help of a comparative case study approach. Six in-depth case studies including expert interviews as well as customer focus groups serve as the basis for the analysis. The analysis results in the identification of three major challenges which mass customization businesses face with the proliferation of new service channels and digital media. The channels and the media indicate ambivalent effects, which in turn influence the value perceptions of customers. These challenges are customers' discovery of the solution space, the perception of creative achievement and the need for reinforcement. The varying levels of social presence across channels and media

are considered as primary reasons for these ambivalent effects. The following *part IV* is based on those findings.

Part IV – Empirical Study 2: Online Customer Co-Design

Part IV explores online customization systems to understand how mechanisms for reinforcement through human feedback are realized. Therefore, the study systematically investigates 115 online customization systems and explores their co-design processes. This large-scale comparative case study approach leads to the identification of two fundamental feedback mechanisms, i.e. shareability of design and interpersonal presence. Rich customer interfaces provide high shareability of designs, i.e. through co-browsing mechanisms, and exhibit high interpersonal presence, i.e. through chat features. Besides that, two dominant approaches have been identified, which are frequently observable in the online mass customization environments. Social customer co-design considers the feedback from friends, e.g. via social media. Live customer co-design considers feedback mechanisms from professional designers of the business, i.e. via live help services. The following study further investigates the last approach.

Part V – Empirical Study 3: Customer Co-Design & Live Help

Part V investigates customer co-design processes in combination with a live help service to understand antecedents and consequences of customers' perceived value. Further on, it questions how live help services may foster online co-design. For this reason, a quasi-experimental field study was conducted in which 205 customers participated. On the basis of structural equation modeling, the study explores to what extent creative achievement plays a dominant role in customers' perceived preference fit of the product. Further on, the study reveals that a live help service may increase service quality. Besides that, live help services turn out to foster customer co-design especially in the later stages of the co-design process. Results are discussed and related to existing work in this research domain. In combination with *part III* and *part IV*, the results reveal a set of interesting findings for the final discussion and conclusion in *part VI*.

Part VI – Discussion and Conclusions

Part VI closes the present thesis with an in-depth discussion of the overall findings and derives conclusions for research and practice. Therefore it is divided into three chapters. The first chapter summarizes each part followed by a comprehensive cross-study discussion of the entire thesis and the depiction of the key learning. In the second chapter, managerial implications are derived for the understanding of customer co-design along three fundamental questions. In the third chapter, avenues for further research are pointed out to motivate further conversations on the topic of customer co-design.

With the six parts previously introduced, the present thesis provides a systematic investigation of customer co-design processes in the mass customization industry. The research was conducted within the context of KUMAC, a joint research project funded by the German Federal Ministry of Education and Science (BMBF). The project is embedded in the national development program "Innovations with Services".[40] Focusing on small and medium-sized enterprises specialized in mass-customization and personalization services, the joint project KUMAC aims to enable these enterprises increasing their productivity and competitiveness.[41] The author gratefully acknowledges the support by the BMBF and the project partners.

After having introduced the relevance of customer co-design, its definition and the structure of the present thesis, the following part II continues with the introduction of the theoretical framework to ground the empirical studies in the academic conversation.

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[40] Grant Code: 01FL10071; For more information on the project KUMAC refer to www.kumac.de.
[41] See www.clicresearch.org/en/projects.

Part II – Theoretical Framework

1   Elucidation of Key Concepts[42]

As outlined in the previous *part I,* the present thesis empirically investigates *customer co-design* within the *mass customization* industry. To guide these empirical studies, the present *part II* derives the theoretical framework to clarify *what* interrelations will be explored and specifies the research design to depict *how* this will be achieved.

Therefore, the present chapter begins with the elucidation of four key concepts, which are identified through a thorough literature review in the domain of mass customization. *First*, the concept of mass customization will be characterized in its fundamental idea and detailed along its four basic principles. *Second*, the concept of perceived value will be introduced, which demonstrates *how* the idea of customization may provide added value for customers as a result of the trade-off between perceived benefits and risks. *Third*, the process of customer co-design will be detailed along five generic stages of interaction towards the final product specification. *Fourth*, the proliferation of service channels and digital media for the various stages in the customer co-design process will be exemplified. After these four key concepts have been introduced, *chapter 2* proceeds to derive the theoretical framework and to detail the overall research question. Finally, *chapter 3* specifies the research design chosen.

1.1   Mass Customization: Characteristics and Principles

Mass customization is a business strategy which intends to provide individualized value to every single customer at a price level which is comparable to non-customized products. Or as Kaplan and Haenlein (2006) put it:

> *"Mass Customization is a strategy that creates value by some form of company-customer interaction at the design stage of the operations level to create customized products, following a hybrid strategy combining cost leadership and differentiation"*[43]

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[42] Part II builds on material from the following earlier publications and conference presentations: Thallmaier, Habicht and Möslein (2012); Thallmaier, Straßburger and Habicht (2012). Further related publications are: Habicht and Thallmaier (2011); Thallmaier (2010).

[43] Kaplan and Haenlein (2006, p. 177)

Hence businesses which strive for this strategy need to develop and operate processes to gather the individual needs of each singular customer and transfer those needs into an appropriately customized offer, i.e. product or service. Concurrently, this business strategy orientates and intends to keep a level of cost efficiency which actually characterizes the idea of traditional mass production strategies. The notion of mass customization is an oxymoron which incorporates the aspects of individual customer value (customization) and high cost efficiency through high volumes in production (mass).[44] The term was initially coined by Davis in 1987 and further explored by Pine in 1992.[45] Davis (1987) in turn builds on the observations published by Toffler in 1970. Back then, Toffler already argued that the increasing demand for individualization would cause mass markets to disappear and would force businesses to orientate towards the individual needs of every single customer.[46] Piller (2000) is among the first to deliver a very detailed and comprehensive investigation of the entire mass customization concept in the German literature.[47] Since then, the concept of mass customization has attracted a lot of interest as a promising business strategy, as Fogliatto et al. (2012) verify through their updated review of the literature published in 2012.[48] As Velamuri notes, mass customization has been intensively investigated in the past two decades by several well-known researchers.[49] Besides that, intensive and discussions have been ongoing in the literature and there is now an international conference dedicated to this specific topic.[50]

The scholars Reichwald and Piller define this business strategy accordingly and specifically emphasize the inherent process of co-design together with the customer.

> "*Mass customization describes the production of goods and services for a (relatively) large market in which the individual needs of every single customer are met. In an interactive co-design process, products and services are defined with customers. These products are offered at prices*

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[44] Kaplan and Haenlein (2006, p. 169)

[45] Toffler (1970); Davis (1987); Pine (1992)

[46] Müller (2007)

[47] Piller (2000)

[48] Fogliatto, da Silveira and Borenstein (2012)

[49] Velamuri (2013)

[50] Refer to the MCPC Conference, i.e. World Conference on Mass Customization, Personalization and Co-Creation; last locations: 2011 San Francisco, USA and 2014 Alborg, Denmark

comparable to those which buyers are willing to pay for an equivalent standardized product."[51]

From the latter definition, four fundamental principles can be derived which characterize the concept of mass customization in more detail, as Müller argues.[52] These principles are introduced in the following paragraphs:
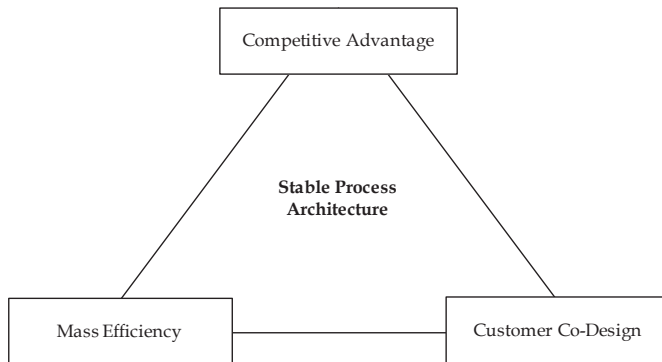
Figure 4: Principles of mass customization[53]

(1) Competitive Advantage

This business strategy intends to gain competitive advantage through an additional value proposition for its customers. This additional value stems from the possibility to react to the individual needs of each single customer. Let us take the apparel industry as one example. Customers could perceive additional value, if a shoe or a shirt fitted their personal body measurements instead of any standardized product, which is only adapted to fit the average measurements of a wider customer segment. Additional value can also be perceived if products can be individually adjusted in terms of visual appearance. Another aspect of individualization can target functional aspects such as quality after washing. Businesses that allow customers to individually adapt their products in terms of these aspects may gain competitive advantage over those businesses which rely on standardized and pre-configured product assortments.

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[51] Reichwald and Piller (2009, p. 199), translated by the author

[52] Müller (2007, p. 27)

[53] Reichwald and Piller (2009, p. 227), translated by the author

(2) Mass Efficiency

Providers who develop and implement mass customization as a business strategy intend to operate with near mass production efficiency. All additional costs which arise through the specificity of this business strategy should be balanced through its potential cost decreasing mechanisms. Müller (2007) names two generic mechanisms. The first concerns the economies of integration, i.e. the possibility to reduce the risk of developing undesirable products through customer know-how and to increase customer dependency on the business provider.[54] The second potential mechanism to decrease costs is the ability of the provider to limit the solution space in terms of customization options. This idea leads to the third fundamental principle in mass customization, the provision of a stable yet flexible process architecture.

(3) Stable Process Architecture

Mass customization does not exhibit the same level of individualization as traditional individualization concepts. Hence in order to keep a high level of mass production efficiency, the potential space for individual customization needs to be limited in certain aspects, otherwise costs increase too much. Hence business providers need to develop a so-called *solution space* which allows for the desired individual customization and concurrently limits the potential variations, so that the costs of logistics or production do not increase for any given product variation. Ideally, this solution space is defined a priori by the mass customization provider. Hence the customer receives flexibility and the provider operates with a stable solution space to control the cost level.

(4) Customer Co-Design

As emphasized in the definition proposed by Reichwald and Piller, the process of customer integration, namely customer co-design, is the fourth fundamental principle of mass customization. In order to deliver individual value to every single customer, information about his personal needs must be gathered, mapped into a specification (*design*) and finally transferred into a product or service. Thereby the customer, although not trained in the domain of design, acts as a *co-designer* to ideate, elaborate and create the design specification for his desired product. Hence

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[54] Müller (2007)

mass customization relies on the principle of interactive customer integration into the value creation process of the business. This fourth principle, i.e. the process of *customer co-design,* stays in the focus of the present thesis.

After the fundamental idea and the basic principles of mass customization have been introduced, the following section focuses on the customer perspective and the question of how the value of the mass customization service may be perceived.

1.2   Perceived Value: Trading-Off Benefits and Risks

As Merle et al. (2008) note, it is important to better understand *how* exactly mass customization businesses create customer value to be able to appropriately adjust operations and thus increase profits.[55] Concerning this essential question, the concept of *perceived value* has received remarkable attention in the relevant literature stream on mass customization.[56]

Therefore *perceived value* is an abstract multi-dimensional construct, which is frequently applied to better understand *how* customers assess and evaluate the utility of a product or service. It is argued that customers' perceived value significantly influences the way customers *intend* and *decide* to purchase products or make use of specific services, such as customer co-design. This assessment is based on the individual perceptions of each single customer and underlies a complex trade-off between beneficial and risk-related components such as mass confusion.[57] Hence customers who purchase the exact same product, i.e. a standardized car, might perceive different values, i.e. either as a symbol of status or as a means to receive personal flexibility.

Perceived value is at the core of many different concepts to describe and understand the value creation process from a customer perspective.[58] Within the literature, many closely related concepts are discussed, which are denoted under similar notions and terms, e.g. customer perceived value by Grönroos (1997)[59], service value by Bolton and Dew (1991)[60] and many more.[61] According to Woodruff

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[55] Merle, Chandon and Roux (2008)

[56] See e.g. Piller and Möslein (2002); Schreier (2006); Franke and Schreier (2008); Merle, Chandon, Roux and Alizon (2010); Turner et al. (2012); Dellaert and Stremersch (2005); Kang and Kim (2012)

[57] Piller, Schubert, Koch and Möslein (2005)

[58] Sanchez-Fernandez and Iniesta-Bonillo (2007)

[59] Grönroos (1997)

[60] Bolton and Drew (1991)

[61] Broekhuizen (2006, p. 44)

(1997), the following commonalities can be identified, which characterize most definitions in terms of perceived value:[62]

- Perceived value is linked to the use of a product or service
- Perceived value is not an objective measure; it is rather a subjective construct, which is individually created by each single customer
- Perceived value is characterized by the trade-off between the benefits a consumer receives through the use of the product or service and the risk facets he is willing to accept

As mentioned, the trade-off between perceived benefits and risks underlies a complex process of assessment and evaluation and as such has attracted much interest from researchers and practitioners trying to understand this complex process. This fact also accounts for the mass customization industry.

Various researchers in this domain distinguish two basic sources of value creation. On the one hand, there is the value which originates from the possession and usage of the custom product, e.g. through better fit, and, on the other hand, there is the value which originates from participation in the co-design process, e.g. customers may perceive fun while designing their desired product.[63] Empirical studies support the applicability of this dichotomy and indicate that the second source of value, i.e. the co-design process, has a direct influence on the perceived value of the custom product. Therefore, besides the relevance of better understanding how customers perceive the value of their custom product, taking care of value creation through the co-design process is of equivalent importance for mass customizers in any product category. On the basis of various empirical studies within the mass customization industry, researchers have identified various relevant dimensions which impact the way benefits or risks are perceived.[64]

Perceived benefits concerning the product:

A recent study by Merle et al. (2008) provides a comprehensive overview over the beneficial aspects and dimensions. The latter study reveals that the perceived benefits of the customized product, are constructed through three potential value dimensions, i.e. utilitarian, uniqueness and self-expressiveness. Utilitarian value

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[62] Woodruff (1997); Broekhuizen (2006, p. 44)

[63] Merle et al. (2008)

[64] Refer to table 1 for a comprehensive overview.

refers to the fit between individual needs and the appropriate product characteristics, i.e. receiving an individual size for a shoe. Uniqueness refers to the fact that the product is only available once and provides the opportunity to stand out of the others. Self-expressiveness refers to the value customers may perceive due to the custom product reflecting their own personality.

Perceived risks concerning the product:

In terms of perceived risks, researches present various dimensions which are either attributed to the custom product or the co-design process. Regarding the product, research frequently refers to the uncertainty a customer may perceive by not being able to see, feel and touch the final product a priori. Further, customers need to accept a waiting time until the design specification is translated into a real product. In some cases this may occur instantly, e.g. t-shirt production within a physical shop environment. In some cases this will take several working days or weeks, dependent upon the complexity of the production process. Regarding the product, customers may perceive the price premium as a risk element.

Perceived benefits concerning the co-design process:

Further on, Merle et al. (2008) investigate the process of co-design and identify two major beneficial value dimensions, i.e. hedonic and creative achievement. The first, hedonic value, refers to the experience a customer may have while designing his product. If the customer enjoys the design process, he perceives hedonic value. Creative achievement is the value customers may perceive through accomplishing a creative task. A closely related value dimension is so-called *pride of authorship*, which has previously been identified by Schreier (2006).[65]

Perceived risks concerning the co-design process:

During the co-design process customers may perceive complexity, e.g. in terms of cognitive overload, as a risk dimension. This may happen if customers are facing difficulties to choose from a huge set of various options. Fearing to not select the right option may cause cognitive complexity, i.e. fearing to regret the decision, which in turn leads to the co-design process being abandoned. Researchers also

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[65] Schreier (2006); Merle et al. (2010, p. 505)

refer to this risk as *mass confusion* or *paradox of choice*. In addition, the effort in terms of time or learning can be perceived as a risk component.

Within the mass customization literature, it is frequently argued that providers need to understand *how* customers perceive value from their service and products in order to be able to optimize their business processes accordingly.[66] The present thesis therefore focuses on the customer co-design process and its beneficial as well as risk-related components in terms of customers' perceived value. The following chapter therefore introduces the generic understanding of the customer co-design process in more detail from a process perspective and from a channel and media perspective.

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[66] Merle et al. (2008)

Table 1: Customers perceived value in mass customization and co-design[67]

		Component	Literature	Description
Perceived Value	**Benefits**			
		Preference Fit	Schreier (2006); Franke & Schreier (2008)	Customers may profit from an increased preference fit, i.e. the closeness between the individual needs and the characteristics of the desired product
	Product	Uniqueness	Franke & Schreier (2008); Merle et al. (2010)	Customers may design a product that is unique with this specific design specification which is not available to others. Thus customers can stand out from others.
		Self-Expression	Merle et al. (2010)	Customers may design and receive an individual product that reflects their own personality and image.
		Enjoyment, Fun, Hedonism	Fiore et al. (2004); Franke & Schreier (2008); Merle et al. (2010)	Customers may derive pleasure, joy or entertainment from the experience when they engage in the co-design process.
	Process	Creative Achievement	Merle et al. (2010)	Customers may feel a sense of creating something new when they engage in the co-design process and make use of the provided autonomy to design their product.
		Pride of Authorship	Franke & Piller (2003); Schreier (2006)	Customers may feel the pride of creating (or having created) something on their own and being the original designer (i.e. author) of their own product.
	Risks			
	Product	Price Premium	Piller & Möslein (2002); Bardakci & Whitelock (2003)	Customized products are more expensive than standardized products. Thus customers need to accept a price premium, i.e. willingness to pay more.
		Wait for Delivery	Bardakci & Whitelock (2003)	A customized product is not ready at the time of purchase. Thus customers need to accept a waiting time for delivery of the product.
		Uncertainty	Delleart & Dabholkar (2009)	Customers may perceive uncertainty about the product characteristics even though close visualization is provided a priori, i.e. through design toolkits.
	Process	Mass Confusion	Huffmann & Kahn (1998); Piller & Schubert (2005)	Customers may perceive confusion when the variety of options is too big and they are facing troubles to overlook the potential solutions in the co-design process.
		Time Effort	Schreier (2006); Schmitz & Dietz (2012)	Customers are required to spend a certain time for the co-design process to reveal their personal preferences and help to translate them into a design specification.
		Cognitive Effort	Schmitz & Dietz (2012)	Customers may perceive cognitive effort when they engage in the co-design process and thus classify the business as undesirable.

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[67] Huffman and Kahn (1998); Piller and Möslein (2002); Franke and Piller (2003); Bardakci and Whitelock (2004); Fiore, Lee and Kunz (2004); Piller et al. (2005); Schreier (2006); Franke and Schreier (2008); Delleart and Dabholkar (2009); Merle et al. (2010); Schmitz and Dietz (2010)

1.3   Customer Co-Design: Stages of Interaction

As outlined in the previous section, customer co-design can be interpreted as a process of interaction between the customer and a mass customization provider. From a theoretical standpoint, this entire process may be divided into a set of multiple generic stages, as Müller (2007) argues.[68] It is assumed that each customer who strives for an individualized product or service needs to go through each stage with the support of the mass customizer. Müller (2007) empirically investigated the process from a customer perspective through means of observations and a series of structured as well as unstructured interviews.[69] Thereby she identified six sequenced stages of customer interaction during the co-design process. These six stages apply to every customer co-design process no matter if it is carried out in an online or offline environment or in any mixed mode.[70] The six stages are introduced stepwise below. Figure 5 depicts the stages in one compact visualization.

The first *stage of communication* is the initial point of contact between customer and provider. The primary goal of this initial interaction is to attract the customer to the mass customization offering and to convey the option of individualizing a product to his personal needs. Within this first stage of contact, it is important that the customer understands his role as a co-designer, because he needs to provide input to finalize the product design.

In stage two, the customer explores the solution space as provided for this specific product category. Here, the customer needs to be served with an environment which facilitates the discovery of the full range of design options. This *stage of exploration* should also provide deeper insight into the process of elaboration and configuration and needs to strengthen the level of consumer trust.

Next comes the *stage of configuration*, in which the final design is specified. In this stage, customer and provider need to converge towards one specific design specification, which can be passed on to the production facilities of the mass customizer. This stage is also supposed to conclude with the action of purchase, as the customer and provider commit to this commercial transaction.

After that, the *stage of waiting and delivery* begins for the customer. The mass customization provider takes care of the production process according to the agreed

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[68] Müller (2007); Franke et al. (2008); Reichwald and Piller (2009)

[69] Müller (2007)

[70] Müller (2007, p. 102)

design specification. Depending on the kind of product, this stage may last for a few days (e.g. shirts from spreadshirt) to several weeks (e.g. shoes from selve). This stage ends with the delivery of the product. In practice, mass customizers handle this stage of delivery differently. Either the product is delivered to a physical store so that the customer may collect it, or it is delivered by the postal services.
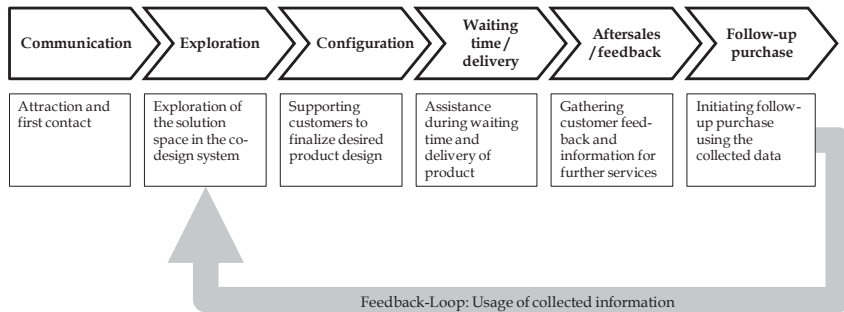
Figure 5: Stages of interaction in mass customization and customer co-design[71]

After successful delivery, customers may use the product and concurrently *the stage of after-sales* begins. Within this stage, the company may provide additional information about the product in use and potentially attract the consumer for additional or complementary goods or services.

The sixth and last stage is the *stage of follow-up purchase*, in which the customer may decide to purchase and design another product. The customer and provider may use the information gathered in the initial co-design process, e.g. measurements regarding sizes. This last stage directly leads to the exploration stage and initiates a new co-design process.

1.4   Proliferation of Service Channels and Digital Media

As illustrated in *part I* mass customization businesses may apply various channels and media to interact with their customers in the co-design process, i.e. web interfaces or personal contact in a physical shop environment.

> "Today's shoppers tend to 'mix and match' channels for product research,
> purchase and delivery. Some shoppers search and browse products online

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[71] Reichwald and Piller (2009, p. 273), translated by the author

> *and go offline for purchase, payment and collection, while others go offline*
> *for the 'feel and touch' experience and conduct the purchase transaction*
> *online for better prices and more attractive promotions."*[72]

With the proliferation of service channels and new media especially in the domain of online communication, all retailers – especially traditional ones with physical shop environments - face new challenges for increasing the efficiency and effectiveness of their service systems as well as for shaping customers' value perceptions.[73] This fact also applies to providers of co-design services in the mass customization industry. Recently, it has been observed and empirically verified that through the new possibilities of the internet, more and more providers of individualized products are relying on the internet as the primary channel of communication and interaction. So-called *toolkits* or *online configurators*, which allow customers to fully control the design process in the online channel are attracting increasing interest from practitioners and researchers alike.

Literature in the domain of service channel management in retailing and commerce reveals a discussion around the fundamental question of *how* channels should be applied to best serve customers and concurrently increase profits.[74] This discussion exhibits manifold facets, but one pivotal point of debate is particularly prominent. This is the discussion of whether to apply a single-channel or any form of multi-/cross-channel strategy. A frequently mentioned argument in favor of a single-channel strategy is that businesses may fully concentrate business process optimization on one single channel and do not run into the complexity of managing several channels in parallel. On the other hand, researchers argue that multi-channel businesses may profit from increasing revenues, as consumers attribute higher value and thus higher willingness to pay for appropriately integrated multi service channels.[75]

As Bolton and Saxena-Iyer (2009) note, businesses such as financial institutions may have as many as 17 channels to serve their customers.[76] To name a few examples, consumers may be served via internet, e-mail, chat, with help from catalogs, kiosks, via phone, on tablets, on smart phones with special applications,

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[72] Swaid and Wigand (2012, p. 301)

[73] Bolton and Saxena-Iyer (2009)

[74] Shankar, Smith and Rangaswamy (2003); Ahn, Ryu and Han (2004); Broekhuizen (2006); Zhang (2008); Jin, Park and Kim (2010); Walsh, Hennig-Thurau, Sassenberg and Bornemann (2010); Lee and Cude (2012); Heinemann (2013)

[75] Neslin et al. (2006, p. 100)

[76] Bolton and Saxena-Iyer (2009, p. 101)

from call centers or machines such as ATMs, etc. Having so many service channels implies the need to better understand how customers perceive value from a set of different service channels and media. To give an example, customers may perceive the service as time saving and more convenient, e.g. when information can be easily retrieved online at any time of the day. Besides that, businesses may save resources, as no employee is confronted with that simple information task.
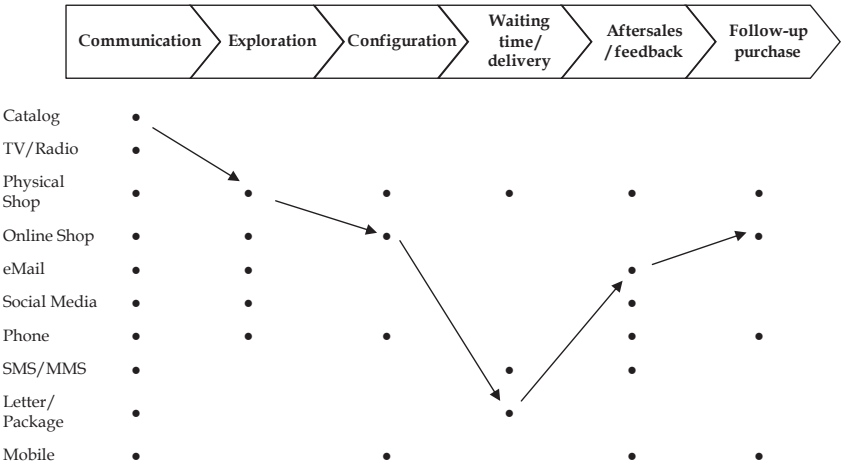
Figure 6: Exemplary process of customer activities in various channels and media[77]

On the other hand, challenges may arise for example concerning the integration of those channels and the adapted behavior of customers. Neslin et al. (2006) differentiate five major challenges which practitioners need to overcome in order to increase customer value through effective acquisition, retention and development in multi-channel environments. These challenges are (a) data integration, (b) understanding consumer behavior, (c) channel evaluation, (d) allocation of resources across channels, and (e) coordination of channel strategies.[78] In a successfully integrated multi-channel environment customers may expect to be provided the exact same information across channels, otherwise the service will potentially be perceived as inconsistent and thus unintended uncertainty may arise. Further, it needs to be stated that customers build their value perceptions on an

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[77] adapted from Heinemann (2013, p. 19)

[78] Neslin et al. (2006)

assessment of all available channels, no matter which channel is actually used to research and purchase the product. This fact has been empirically verified by Montoya et al. (2003), who statistically investigated the impact on perceived quality of the pure existence of an alternative channel in a service setting.[79] The latter authors conclude that in a multi-channel setting, customers' overall perception is shaped through both the *online* and the *offline* or traditional channel.[80] Swaid and Wigand (2012) conclude

> *"Multichannel retailers need to get smarter by offering their customers an integrated shopping experience across multiple channels."[81]*

However to achieve this, mass customizers need to understand how the various channels and media impact the shopping experience, i.e. process of customer co-design or as Broekhuizen (2011) notes:

> *"Understanding how each channel provides value to customers is just a first step to optimize the channel mix."[82]*

Especially the specificities of the different stages in the co-design process in contrast to common shopping processes for non-customized, i.e. standardized, products need to be considered for the following research. To guide this research the following chapter will derive the theoretical framework which is based on the four aforementioned key concepts, i.e. *mass customization*, *customer co-design*, *customers perceived value* and *proliferation of service channels and digital media* and the research question proposed in part I.

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[79] Montoya-Weiss et al. (2003)

[80] Montoya-Weiss et al. (2003)

[81] Swaid and Wigand (2012, p. 309)

[82] Broekhuizen (2006, p. 193)

2 Derivation of Theoretical Framework

Based on the research question proposed in part I and the elucidation of the four key concepts on the previous pages of part II, the present chapter will derive, explain and graphically depict the theoretical framework which guides the empirical research.

The theoretical framework clarifies the author's perspective on the interrelation of the identified key concepts and is a necessary step in exploratory research to explicate the underlying assumptions for the following empirical studies.[83] Therefore the theoretical framework serves various purposes, as Herek (2001) notes. First, it enables a critical evaluation of the underlying assumptions. Second, it enables the empirical research to be connected to the appropriate discussions in academic literature. Third, it supports the researcher in the process of generalizing from particular phenomena observed in the empirical studies. And fourth, the theoretical framework sets the boundaries for those generalizations.[84] The derivation of the theoretical framework follows the logic proposed by Herek (2011), who argues that the

> "task of developing a theoretical framework starts with asking a research question, proceeds through the task of identifying key variables and the relationships among them, and results in a plan for empirically observing those variables and relationships."[85]

As outlined in part I of this thesis, the initial research question reads:

> How should mass customizers coordinate the strengths of various service channels and digital media to increase customers' value perception?

The initial research question is based upon the assumption that various service channels and digital media, e.g. online, in-store or mobile, exhibit strengths and weaknesses in terms of value creation from the customer's perspective. A thorough literature review in the domain of mass customization reveals four key concepts which help to frame this assumption in the theoretical framework.

First, there is the context of mass customization. The present thesis explicitly focuses on the mass customization industry as empirical field of inquiry.

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[83] Herek (2011)
[84] Herek (2011)
[85] Herek (2011, p. 138)

Generalizations beyond the industry of mass customization may be applicable, but are not covered by the scope of the present research. Further, as outlined in the previous chapter, mass customization exhibits specific characteristics and principles. One remarkable principle from the customers' perspective is the process of co-design. It is a prerequisite for designing a custom product which fits the personal preferences of each singular customer and is offered at a reasonable price. Besides, it is argued in the literature that companies need to understand how the mass customization program adds value for customers.[86] The concept of *customers' perceived value* has attracted remarkable interest in this discussion.[87] Here, it is further argued that customers may perceive value from two sources, i.e. the custom product and the co-design process. However, customers may also perceive costs which may be derived from the process of co-design and the custom product. It is further assumed and validated that customers' purchase intention is the result of the trade-off between perceived benefits and perceived costs.[88] Increasing customers' perceived value is one major goal that mass customization businesses are striving for.

Whether the co-design process is realized in-store (selve) or online (Spreadshirt) every customer will go through a generic set of stages as depicted in figure 5. The first three stages, i.e. communication, exploration and configuration, are in the focus of the present thesis, as they comprise the process of customer co-design towards the completion of the order. The following three stages, i.e. waiting time/delivery, aftersales/feedback and follow-up purchase, are typically processed after the completion of the design specification and the customer's order. Thus these stages are outside the scope of this thesis, although they are relevant to the success of mass customizers. It should be noted here that, in contrast to first-time customers, returning customers may start the process of co-design already in the second stage, i.e. exploration, because they are already acquainted with the co-design idea from their first purchase.

Finally, the fourth key concept, i.e. the proliferation of service channels and digital media, needs to be considered in the framework. As outlined above, it is argued that channels and media are assumed to impact the way customers perceive value from the co-design process. Dependent upon the characteristics of the channel

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[86] Merle et al. (2010)

[87] Refer to table 1 and Huffman and Kahn (1998); Piller and Möslein (2002); Franke and Piller (2003); Bardakci and Whitelock (2004); Fiore et al. (2004); Piller et al. (2005); Schreier (2006); Franke and Schreier (2008); Dellaert and Dabholkar (2009); Merle et al. (2010); Schmitz and Dietz (2010)

[88] Piller et al. (2005)

and interaction media, the value customers perceive in different components may be strengthened or weakened. However, the question that remains open is how this occurs and why. Thus based on the aforementioned interrelation of key concepts, the initial research question proposed in part I can be further detailed:

> *How do service channels and new media impact perceived value in the first*
> *stages of customer co-design within the mass customization context?*

The answer to this question enables mass customizers to leverage strengths and weaknesses of different digital media and optimize the channel mix to increase customers' perceived value. Thus service channels and new media are modeled as a moderator in the relationship between the process of customer co-design and the goal to increase customers' perceived value. Following this line of argumentation the theoretical framework can be derived (figure 7).
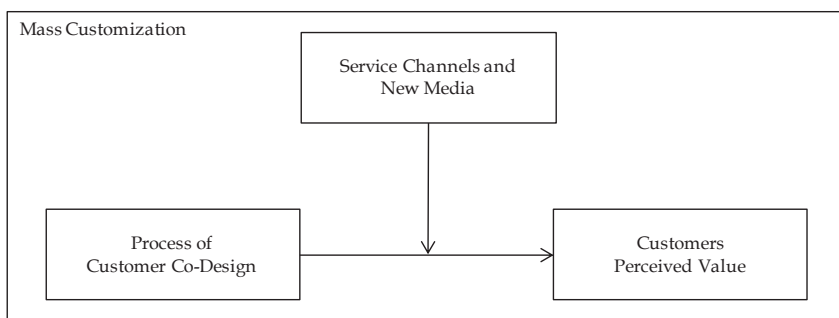
Figure 7: Theoretical framework for thesis

In order to answer the detailed research question in a systematic manner, it will be split up into multiple empirical studies. This step helps to reduce the complexity of the phenomenon under study and helps to structure the research process in a meaningful way. This research design will be specified in the following chapter.

3   Specification of Research Design

Based on the previous work, the present chapter specifies the research design chosen and clarifies the partitioning of the detailed research question into subordinated research questions to be answered within three empirical studies.

To answer the detailed research question proposed in the previous chapter, a research design is chosen which exhibits an exploratory character. Exploration is appropriate in settings where the focus is on a rather new phenomenon.[89] For the present research, the rather new phenomenon appears to be the interplay of the four key concepts depicted by the theoretical framework in figure 7. The task is to explore this interplay and derive implications for research into customer co-design and the managerial practice of mass customization. Further, it was decided to employ mixed methods in the research design considering qualitative and quantitative procedures to explore the interplay. This decision reflects the reviewed literature in mass customization, where both procedures have been repeatedly reported.[90] It is frequently argued that mixed methods may increase the reliability of findings, as they build upon multiple data-gathering techniques as well as modes of data analysis to understand the phenomenon. Further, mixed methods are the appropriate choice for researchers who intend to derive their "*knowledge claims on pragmatic grounds*".[91]

Based on that previous decisions, the sequential exploratory research design employing mixed methods proposed by Creswell (2003) was chosen.[92]

> "*At the most basic level, the purpose of this strategy is to use quantitative data and results to assist in the interpretation of qualitative findings.*"[93]

The major characteristic of this research design is its sequential two-phase approach. In the first phase, qualitative data are gathered and analyzed. In the second phase, quantitative data collection and analysis takes place.

> "*Its two-phase approach makes it easy to implement and straightforward do describe and report.*"[94]

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[89] Creswell (2008, p. 215)

[90] See Fogliatto et al. (2012, p. 16) for a recent literature review on mass customization and the main methods applied in this domain.

[91] Creswell (2008, p. 18)

[92] Creswell (2008, p. 213)

[93] Creswell (2008, p. 215)

Finally, an interpretation of the entire analysis across the two phases is conducted. Figure 8 depicts the chosen research design embedded into the overall structure of this thesis, which is outlined in the introduction.[95]

| Foundation | **Part I - Introduction**

• Empirical evidence
• 2 illustrative examples | **Part II - Theoretical Framework**

• Elucidation of key concepts
• Derivation of theoretical framework |

Qualitative Methods

| | **Part III - Empirical Study 1**

• Explorative interview study
• 6 in-depth cases
• 12 expert interviews
• 2 customer focus groups | **Part IV - Empirical Study 2**

• Large-scale analysis
• 115 co-design interfaces
• Cross-cases comparison
• 3 investigators |

Exploration

Quantitative Methods

Part V - Empirical Study 3

• Quasi-experimental field study
• online cusotmization program by selve
• live help system by vee24
• 205 survey participants

| Implication | **Part VI – Discussion and Conclusion**

• Summary and discussion of findings
• Managerial implications
• Directions for future research |

Figure 8: Sequential exploratory research design employing mixed methods[96]

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[94] Creswell (2008, p. 216)

[95] Within dissertation theses it is common to differentiate between structure and design. The structure of the thesis depicts the hierarchical order of the singular parts or chapters. The research design in contrast depicts the logical sequence of research steps and their dependencies. Also see Töpfer (2010, p. 33).

[96] Own illustration

Part I in combination with *part II* comprises the motivational and theoretical foundation of this work. The following exploration exhibits the main body of the present thesis and comprises the sequential exploratory research design with its two-phase approach employing mixed methods. Phase one exhibits the qualitative methods reported in *part III* with empirical study 1 and *part IV* with empirical study 2. Phase two exhibits the quantitative methods reported in *part V* with empirical study 3. Finally, the entire findings are interpreted and discussed across the three studies in *part VI* to derive implications for research and practice.

Hence the exploration of the phenomenon under study is partitioned into three empirical studies. Empirical studies 1, 2 and 3 each answer subordinated research questions which are introduced below. Empirical study 1 in *part III* answers the subordinated research question:

> *What are the key challenges for achieving high perceived value for customers when applying digital media to co-design processes?*

The first study employs the theory of social presence to explain the differences between in-store and online customer co-design. Six in-depth case studies are conducted which are based on 12 expert interviews and two customer focus groups. The cross-case analysis reveals three key challenges. Empirical study 2 in *part IV* then focuses on the following subordinated research questions:

> *RQ1: What mechanisms of interactive media facilitate positive reinforcement through human interaction in online customer co-design?*
>
> *RQ2: What are the dominant approaches for facilitating positive reinforcement through online media in customer co-design?*

To answer these aforementioned questions, study 2 employs the theory of media richness. It builds upon a large-scale cross-case analysis of 115 online mass customizers with multiple investigators to explore processes of online customer co-design. Based on the insights of the previous qualitative explorations, i.e. part III and part IV, empirical study 3 then answers the following subordinated research questions:

> *RQ1: What are the antecedents and consequences of the co-design value perceived by customers when using an online customization system?*
>
> *RQ2: How does live help and an increased social presence impact the value perceived by customers when using online customization systems?*

To answer these questions, a quasi-experimental field study is conducted. It employs the theory of social presence and investigates its impact on an online co-

design process. This study is conducted with two partners from practice, the shoe customizer selve and the live help provider Vee24. More than 200 customers participated and provided their feedback via an online survey. The collected data is then analyzed through structural equation modeling (SEM) and the method of partial least squares (PLS).

Finally, *part VI* delivers an interpretation of the entire analysis to round up the present thesis. It summarizes each empirical study, discusses their contributions across the findings, derives managerial implications and finally provides directions for future research. Before beginning with *part III* it needs to be noted here that all three empirical studies are preceded by a structured abstract which provides a short one-page overview of every chapter in the subsequent study.

Part III – Empirical Study 1: Challenges of Customer Co-Design

Structured Abstract

Needs/Goals: Whether the process of *customer co-design* is realized in-store (selve, ErtlRenz) or entirely over the internet (Spreadshirt, DeinDesign, MyParfuem, DreiGuerteltiere), increasing customers' *perceived value* is the linchpin to leveraging mass customization (Berger & Piller, 2003). The increasing proliferation of digital media at this customer interface requires a better understanding of how this impacts the process of value creation. Thus the goal of this study is to explore the impact of *digital media* on customers' *perceived value* in processes of *co-design*.

Theoretical Underpinning: The customer value derived from co-design is the trade-off between perceived benefits and costs. Mass confusion is frequently addressed as a major cost component. Benefits are related to hedonism and creative achievement (Merle, 2008) and/or pride of authorship (Schreier, 2006). A remarkable difference between co-designing products in-store and online is the presence of human and social elements (Hassanein & Head, 2007). Thus, to explain the impacts of digital media on perceived value, the theory of social presence is employed.

Method/Data: Our study follows an exploratory case study approach. Six mass customization providers were selected for an in-depth analysis of their respective in-store as well as online co-design processes. Data was collected through web-based documentary research, participant observation, semi-structured expert interviews as well as two focus groups with customers. The subsequent cross-case analysis follows an iterative step-by-step approach, in which the technique of constant comparison was applied (Glaser & Strauss, 1967).

Findings: Three key challenges are explored: (1) Encouraging discovery addresses the fact, that digital media tend to limit discovery yield. (2) Fostering creativity addresses the fact that customers need to be served with digital media which allow for creative achievement. (3) Facilitating reinforcement addresses the fact that digital media tend to neglect the direct human feedback and enjoyment.

Conclusion/Future Research: Mass customizers need to consider the level of social presence that digital media afford to customers. Providing media with more social presence may encourage discovery and facilitate reinforcement, whereas media with less social presence tend to foster creative achievement and strengthen the perception of pride. Future research needs to consider processes of customer co-design, which allow the level of social presence to be adapted either in-store, e.g. using tablet solutions, or online, i.e. curated co-design with chat.

1   Need and Goals[97]

"The customer experience is the next competitive battleground."

– Jerry Gregoire

Customer co-design exhibits a process in which customers and business providers collaboratively map the personal requirements of the customers into the design specification of the individual product.[98]

"Integrating customers in activities of product specification and co-design is a fundamental principle of MC, allowing the collection and storing of information on customer choices."[99]

Whether this process is realized in-store or entirely over the internet, efficient systems for *customer co-design* are the linchpin to leveraging mass customization.[100] Until now research in operations management has mainly investigated mass customization from an organizational viewpoint to understand efficiency in terms of production and delivery, i.e. focusing on the trade-offs between costs, throughput time and product quality.[101] However, Merle et al. (2012) argue that these research efforts are not sufficient, because they tend to ignore the customer's value perspective.[102]

"The best and most advanced fulfillment system is worthless if it cannot express its added value to the customer"[103]

Hence understanding *how* customers *perceive value* through the co-design process is of at least equivalent importance in achieving success in mass customization.[104]

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[97] Part III is based on a conference paper presented at the 2011 World Conference on Mass Customization, Personalization and Co-Creation in San Francisco (MCPC) as Thallmaier et al. (2012). A further developed version of part III is accepted for publication in the anthology *Management of Permanent Change*. It is published in co-authorship with Dr. Hagen Habicht as Thallmaier and Habicht (2014a). Key results of the study are also summarized as a transfer report for the German brochure *Produktindividualisierung im Einzelhandel*. This transfer report is co-authored by Dr. Hagen Habicht as Thallmaier and Habicht (2014b).

[98] Piller et al. (2005)

[99] Fogliatto et al. (2012, p. 21)

[100] Piller and Berger (2003)

[101] Fogliatto et al. (2012)

[102] Merle et al. (2010)

[103] Piller and Berger (2003, p. 44)

From a customers viewpoint, however, spending less time for co-designing a product does not necessarily increase efficiency in terms of perceived value. The opposite may even be the case, i.e. it may be that spending more time increases enjoyment. This means that investigations of efficiency from a customers perspective need to reconsider the trade-off between the perceived costs of engaging in the co-design process, such as *mass confusion*, and the perceived benefits, such as *hedonism* and *creative achievement*. Thus, it is important to identify mechanisms to decrease customers' perceived costs and concurrently increase perceived benefits in order to foster the attractiveness of co-design processes and with it respectively the success of mass customization.

Undoubtedly, the proliferation of digital media plays a major role in this context. This fact not only concerns co-design processes in the quickly emerging online market, e.g. through toolkits, social media and live chat, but also in-store processes, e.g. through tablet solutions, kiosks, scanners and smart-phones. Digital media are applied to serve various customer purposes in their co-design process. They may be applied to provide design inspiration, to visualize the preliminary design, to explore pre-configured products, to discover design parameters, to specify desired requirements, to interact with others on design ideas or to gather customer data such as body measurements, photos, preferences, contact data, payment data etc. In addition, digital media may either be controlled by the customer (e.g. online) or by sales representatives who are present (e.g. in-store).

Recent studies in mass customization predominantly investigate this proliferation of digital media as a means of increasing the efficiency of co-design processes from an operations management perspective. In the quickly emerging online context, this means following the idea of serving customers anytime and anyplace. However, previous research in the field of mass customization has overlooked contexts, i.e. in-store vs. online, in which digital media are used to (positively) impact customer value perception.[105] Therefore the current study intends to close this specific gap by following the research question:

> *What are the key challenges for achieving high perceived value for customers when applying digital media to co-design processes?*

To answer this research question, the present study is presented in five chapters. Building on the identified research gap, chapter 2 presents the theoretical

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[104] Schreier (2006)

[105] Schmitz and Dietz (2010, p. 64)

underpinning. This foundation will firstly consider the concept of customer perceived value in the context of co-design mass customization processes. Secondly, it will detail the theory of social presence, which accounts for the difference in human and social elements between in-store and online co-design. Chapter 3 describes the selected research design and details the processes of empirical data gathering and analysis. Chapter 4 presents the key findings. In the concluding chapter 5, the results are reflected with findings from related research streams, and avenues for further studies are presented.

2 Theoretical Underpinning

Within the literature stream of mass customization it is frequently argued that customers may perceive value from two basic sources.[106] The first source relates to the characteristics of the customized product, which are expected to fit each customer's personal needs. The second source concerns the process of co-design, which is an essential prerequisite to building and receiving the product. The current study focuses on the second source, i.e. the perceived value from the process of co-design. Important benefits, as well as cost components, which are assumed to originate from the process of co-design, are introduced, based on a literature review of perceived value within the context of mass customization *(section 2.1)*.

As noted earlier, a remarkable difference between applying digital media in-store and online is the existence of human and social elements.[107] It is frequently argued that online interfaces lack the possibility for direct human contact and interpersonal exchange in comparison to processes in-store, where customers may contact sales personnel or their shopping partners, i.e. family and friends.[108] In order to account for this fact, the theory of social presence will be introduced as underpinning for the subsequent analysis (*section 2.2*). Based on a literature review in the commercial context, selected findings will be presented, which display the current theoretical understanding of how social presence relates to components of perceived value.

2.1 Customer Value from Co-Design

The customer value derived from co-design is the trade-off between perceived benefits and costs. As Ihl et al. (2006) identify, the result of this trade-off significantly influences customers' overall satisfaction with the mass customization provider.[109] Thus it is necessary to identify and understand each single dimension which contributes to this trade-off. Merle et al. (2008) add to this understanding by distinguishing two important beneficial dimensions, i.e. hedonic and creative achievement.[110] According to them, hedonic benefits are widely accepted in mass

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[106] Piller and Möslein (2002); Merle et al. (2008); Schreier (2006)

[107] Hassanein and Head (2007)

[108] Gefen and Straub (2004)

[109] Ihl, Müller, Piller and Reichwald (2006)

[110] Merle et al. (2008, p. 31)

customization, but few authors refer to the value of creative achievement. Both dimensions are introduced in more detail below.

Hedonic value refers to intrinsic motives which are activated by allowing customers to engage in co-design. For example, Schreier (2006) attributes a significant part of the value increment of mass-customized products to hedonic benefits which stem from the co-design process. He denotes those benefits with the term *process benefits*, which are expected to meet the individual needs of customers, i.e. experiential needs such as trial and error.[111] Hence, the chance to select various product attributes, features or colors, to adapt and change visualizations, to compare and discard ideas, to elaborate and finish a design delivers value to customers.[112] According to Merle et al. (2008), this dimension is related to the concept of striving for an attractive shopping experience.[113] Delleart and Dabholkar (2009) state that *enjoyment* of the co-design process can be induced either through an attractive technology-based experience or the excitement of creating one's ideal product.[114] Furthermore, Fiore et al. (2004) argue that the co-design process itself can motivate users to engage as co-designers as it comprises an *exciting experience*.[115] In a same vein, Piller argues that the task of designing one's own product may exhibit a *flow experience* which in turn is expected to mitigate cognitive efforts (i.e. mass confusion) which may arise during the process.[116]

Creative achievement refers to the creativity and pride customers may experience through originating a new or even unique product.[117] This feeling has also been compared to artists or chefs, who experience the feeling of achievement as they create a painting or a delicious meal.[118] The closely related notion is the so-called *pride of authorship* effect.[119] Merle et al. (2010) empirically show that creative achievement is a distinct component of co-design value with a positive influence on the overall value perception of the mass customization offer.[120] Hence, co-designing one's own products can be seen as a source of creative achievement and pride.

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[111] Schreier (2006)

[112] Schreier (2006)

[113] Merle et al. (2008)

[114] Dellaert and Dabholkar (2009)

[115] Fiore et al. (2004)

[116] Piller et al. (2005)

[117] Franke and Piller (2003)

[118] Schreier (2006)

[119] Merle et al. (2010, p. 505)

[120] Merle et al. (2010)

Mass Confusion or paradox of choice are among the most frequently studied cost dimensions in processes of customer co-design. Mass confusion refers to the fact that customers may get confused when facing a huge amount of options. The mass of possible choices imposes two potential risks. Customers may not be able to choose, because they are confused. Or they may not choose, because they are afraid of regretting their decision.[121] Both cases increase the likelihood of customers abandoning the co-design process.

Altogether, the literature suggests various beneficial components of the perceived value from a co-design process, i.e. *hedonic value* and *creative achievement value*. At the same time, risk components have been described. Besides the previously addressed component of *mass confusion*[122], customers may perceive costs through *time effort*[123] and *learning effort*[124], which reduce the value of co-design.[125] In sum, customers' perceived value thus incorporates a trade-off between the previously mentioned benefits and risks. The resulting evaluation is expected to affect the purchase intention and decision.

2.2   Social Presence Theory

As Hassanein and Head (2007) note, a remarkable difference between co-designing products in-store and online is the presence of human and social elements. To account for this difference and to assess the impact on customer value from co-design, the theory of social presence will be employed in this study. The theory of social presence, introduced by Short et al. (1976), is among the most frequently used concepts to evaluate and explain media impact on communication science including commercial settings such as mass customization. The theory considers social presence as an inherent element of communication media.[126] Short et al. (1976) define *social presence* as the

> "*degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships*"[127]

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[121] Randall, Terwiesch and Ulrich (2005)

[122] Piller, Koch, Möslein and Schubert (2003)

[123] Schreier (2006)

[124] Schmitz and Dietz (2010)

[125] Please refer to chapter 1.2 in part II of this thesis for a detailed elucidation of benefits and risks derived from the co-design process.

[126] Short, Williams and Christie (1976)

[127] Short et al. (1976)

Simply put, the degree of *social presence* in communication is higher if the communication partner perceives the contact as more personal, warmer and more sensitive.[128] According to this perspective it can be stated, that face-to-face interaction usually provides the highest level of social presence, whereas written communication provides a low degree of social presence. The latter provides less cues to transmit information compared to the face-to-face setting in which the communication partners may consider facial expressions, postures and other non-verbal cues. With this interpretation in mind, the theory of social presence is associated with the "cues-filtered-out" perspective. According to Möslein (1999), it implies that any kind of mediated communication and interaction is less personal than traditional face-to-face exchange, simply because various cues are not available for information exchange.[129]

Applying this theory to the present context, it can be stated, that co-designing products in-store characterizes a setting with a high level of social presence. Customers can be served by sales representatives and receive personal consultation face-to-face while in-store. In addition, family members or friends may accompany the co-design process, whereas in the online context co-designing products is often characterized by a low level of social presence. When customers decide to visit the website and apply the online toolkit to customize their product, no direct human contact exists. This setting mostly comprises the isolated dyadic interaction between the customer and his or her digital device.[130]

It is frequently argued, that in-store shopping benefits from direct human contact. This means that the presence of other humans positively impacts customers' perceived enjoyment. Several studies have investigated this relationship in the online context. One example is the study by Hassanein and Head (2006). They identify that the relationship between social presence and enjoyment depends on the product category being sold. They argue that

> *"Web sites selling apparel (a product for which consumers seek fun and entertaining shopping experiences) benefit from higher levels of social presence. On the other hand, Web [sic] sites selling headphones (a product for which consumers primarily seek detailed product information) do not exhibit a positive effect from higher levels of social presence."[131]*

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[128] Döring (2003, p. 132)

[129] Möslein (1999)

[130] Franke et al. (2008, p. 547)

[131] Hassanein and Head (2006, pp. 45–46)

3 Method and Data

This chapter details the method and the data of the empirical study. The first section introduces the *research approach*. It argues for a qualitative case study design. The second section describes the steps of *data gathering* and details the applied techniques. Finally, section three lays out the process of *data analysis* according to the principles of grounded theory building.

3.1 Research approach

Customer co-design is a fairly new phenomenon in innovation research.[132] As a consequence, the current understanding how digital media impact customers perceived value within the process of co-design is still very limited. Against this backdrop, the identification and description of current challenges in the proliferation of co-design services across digital media in-store as well as online requires an exploratory research approach for which qualitative research designs are seen as most appropriate.[133] In particular, qualitative research approaches allow new facets and nuances of under-researched phenomena to be uncovered. Furthermore, they enable the researcher to place equal emphasis on the context within which the phenomenon is embedded, which again increases the understanding of interdependencies, and causality in particular. Hence, qualitative research is suited for exploration, discovery, the deriving of theoretical differentiations and potential relationships in contexts where little is known about the underlying phenomena or mechanisms.[134]

We followed the frequently applied case study method as characterized by Yin (2009) because it is capable of capturing unclear phenomena in a real-life context.[135] In particular in the form of an embedded case design it combines qualitative data from various and heterogeneous sources for in-case as well as cross-case analysis and provides flexibility, especially when data sources contain huge amounts of qualitative information, e.g. through semi-structured interviews or customer focus groups with open-ended questions.

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[132] Piller et al. (2005)

[133] Eisenhardt (1989)

[134] Yin (2009)

[135] Yin (2009)

This is a necessary pre-requisite for our study, as the process of customer co-design represents the interactive value creation between customer and the providing mass customizer. Thus, to explore the co-design process it needs to be approached from two perspectives: the customer's perspective and the provider's perspective. Consequently, data was collected from both knowledge domains (providers and customers) and through a particular combination of techniques, which will be detailed in the following section.[136]

Second, cross-case comparison allows variables and dimensions to be derived, which are necessary to build theoretical explanations, differentiations and relationships for the phenomenon under study. The multiplicity of cases is considered to deliver more robust findings in comparison to a single case study. Hence, we analyzed multiple cases of co-design processes in depth.

The chosen research approach represents a *multiple embedded case study design* as it is defined by Yin (2009).[137] Each case is one independent mass customization business. The unit of analysis is the respective customer co-design process, which is embedded into the case. Thus each co-design process can be considered from both perspectives, i.e. customers and providers. In the following the process of data gathering will be detailed.

3.2 Data Gathering

The process of data gathering started with the selection of appropriate cases, i.e. mass customization companies. The selection process followed the strategy of *theoretical sampling* as it was initially proposed by Glaser and Strauss (1967).[138] This sampling strategy is supposed to best suit research contexts, in which the extent and characteristics of the unit of analysis are unknown.[139] Sampling is performed according to a priori developed or emerging selection criteria, which are supposed to yield new knowledge concerning the proposed research question. For the present study, cases have been selected based on (a) the complexity and approach of the co-design process and (b) the variety of service channels and the media employed to serve customers in designing their own individual products. The sampling process yielded six mass customization cases which deploy various channel strategies and

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[136] Yin (2009)

[137] Yin (2009)

[138] Glaser and Strauss (1967)

[139] Lamnek (2008)

provide heterogeneous media to serve customers in conducting co-design processes of different levels of complexity (see table 2).

Table 2: Sample of cases with various customer co-design processes

#	Case Name & Web Presence	Custom Product Category	Characteristics of Customer Co-Design Process
1	**selve** www.selve.de	luxury foot-wear for men and women; bags	Co-design in-store and online offered: in-store with sales personnel, online via a toolkit based on solution and need information
2	**ErtlRenz** www.ertlrenz.de	sports shoes, mainly ski boots, and shoes for golf, running, hiking	Co-design purely in-store (retailers) with the help of professional sales personnel; based on need information
3	**Spreadshirt** www.spreadshirt.de	apparel, mainly t-shirts, bags, pullovers, accessories	Co-design strongly focused on online via a toolkit; sporadic in-store workshops are held; based on solution information
4	**DeinDesgin** www.designskins.com	skins for electronic devices	Co-design purely online via a toolkit; customers may choose between pre-configured or self-designed covers; based on solution information
5	**3Guerteltiere** www.dreigurteltiere.de	multi-color belts made of fabric or leather	Co-design purely online via a simple toolkit; pre-designed belts also sold via in-store retailers; based on solution information
6	**MyParfuem** www.myparfuem.de	Fragrances and flacons for women and men	Co-design purely online via a simple toolkit or a set of guiding questions; based on solution and need information

For each of the cases, data from multiple sources were collected. Data collection started with a detailed description of the MC offer based on publicly available documents and participant observations of the provided co-design processes. In addition, we conducted expert interviews with representatives of each company in order to capture the provider perspective as well as two focus groups with customers of selve AG to collect data on the customer perspective. The data collection from experts and customers is reported in more detail in the following subsections.

3.2.1   Expert Interviews

To capture the provider's perspective, semi-structured interviews with managers and management advisors of the founders were performed. A priori an interview guideline was developed in close partnership with two senior researchers in the

domain of mass customization.[140] This careful preparation ensured relevancy of questions and allowed a comparable set of answers to be initiated, as all managers received the same set of open-ended questions.[141] It followed the systematic structure of explanative questions for clarification, open ended questions for narration, inquiring questions for deeper understanding, and summarizing for self-reflection as proposed by Lamnek (2005).[142]

All interviewed experts were highly interested in the topic under study and showed a strong motivation to take part in this study. According to them, the topic itself was highly interesting, as it reflected their daily struggles to increasing customer value. As a consequence, all of them contributed valuable insights not only into their processes of customer co-design, but also concerning the context of their offers, such as their strategic and operational orientation. Every interview was conducted with two researchers. Interviews typically lasted for one hour and were (with the exception of one) conducted in the offices of the company. One interview took place via phone as no personal meeting could be arranged in time. All 12 expert interviews (see table 3) were audio taped and subsequently transcribed verbatim.[143]

Table 3: List of expert interviews

#	Case Name	Number of Interviews	Respondent's Role in the Mass Customization Business
1	selve	3	Founder & CEO; Marketing Manager; Sales Representative;
2	ErtlRenz	3	Technology Manager; Marketing Manager; Management Advisor
3	Spreadshirt	3	Community Manager; Toolkit Developer; Management Advisor
4	MyParfuem	1	Founder & CEO
5	3Gürteltiere	1	Founder & CEO
6	DeinDesign	1	Founder & CEO

3.2.2 Customer Focus Groups

In order to cover the customer perspective on the digital media impact on processes of co-design, two focus groups were conducted, with six selected customers each.

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[140] Senior researchers from HHL Leipzig Graduate School of Management and the RWTH Aachen

[141] Atteslander and Cromm (2008)

[142] Lamnek (2008, pp. 358–359)

[143] See Annex A for the German guideline applied in the expert interviews.

Moderated focus groups are frequently applied as independent instruments for data gathering in combination with surveys, observations or expert interviews.[144] We used focus group as a method, because

> "*it is particularly useful when researchers seek to discover participants'*
> *meanings and ways of understanding.*"[145]

Focus groups profit from the fact that participants inspire each other through mutual feedback. Focus groups also help to elicit counter arguments as well as alternative supporting arguments for relevant issues. Second, and in contrast to managers of the selected service providers, customers are not constantly involved in co-design processes. Hence, the possibility to reflect upon their individual experiences helped to stimulate more valuable feedback compared to individual customer interviews. However, focus groups increase the complexity of the data gathering process to a large extent. Hence, a thoughtful preparation has been performed to minimize the negative effects of group discussions, such as opinion leadership and a lack of focus on the intended topic of co-design.

   Both focus groups consisted of customers from one mass customization company, i.e. selve. Selve is the only company in the sample which provides two fully independent media support methods for the same co-design task. Selve allows customers to carry out all steps of the co-design process online and in-store. Hence, customers were able to report on their perceptions of both fundamental settings. Invited participants received a 50% reduction on their next purchase as an incentive to take part in the group discussion. Both focus groups were jointly moderated by a team of two researchers in order to ensure a high quality of moderation. The rules of moderation have been adapted according to the suggestions by Flick (2007).[146] Guiding questions and time management have been developed in advance with the help of two senior researchers in the domain of innovation management.[147]

3.3   Data Analysis

In total, the semi-structured interviews and the customer focus groups resulted in 248 pages of transcribed text. The data were analyzed using professional

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[144] Flick (2007)

[145] Lunt and Livingstone (1996)

[146] Flick (2007, p. 259)

[147] See Annex B for the German guideline applied in both customer focus groups.

QDA-software.[148] Data analysis followed the standards for qualitative research as reported by Eisenhardt (1989) as well as by Miles and Huberman (2009).[149] It followed the iterative step-by-step approach of constant comparison as suggested by Glaser and Strauss (1967).[150] This process of analysis exhibits four steps as depicted in Figure 9. Relevant quotes were systematically identified and used as anchors to derive and develop appropriate codes - a single word or a short phrase that captured the essence of the related quote. Codes were subsequently grouped according to the similarity of meaning. During this stage, the researchers constantly compared quotes, codes and code groups in order to achieve a transparent final arrangement. In the third step, groups of codes were analyzed, compared and arranged to form categories and to verify/reject relationships among them. The final groups of codes were analyzed in order to identify higher order categories which best reflected the initiating research question. To reduce bias of subjective analysis, two researchers performed each step of analysis independently, applying the same software tool and the same technique of analysis. Subsequent to each step, an investigator triangulation process as suggested by Yin (2009) was performed.[151]

Step 1:	Step 2:	Step 3:	Step 4:
Collection and transcription of interview data	Identification of relevant quotes and open coding	Grouping of similar codes into subcategories	Consolidation of subcategories into final categories
14 transcripts ~ 248 pages	~ 660 quotes ~ 390 codes	12 subcategories	3 final categories
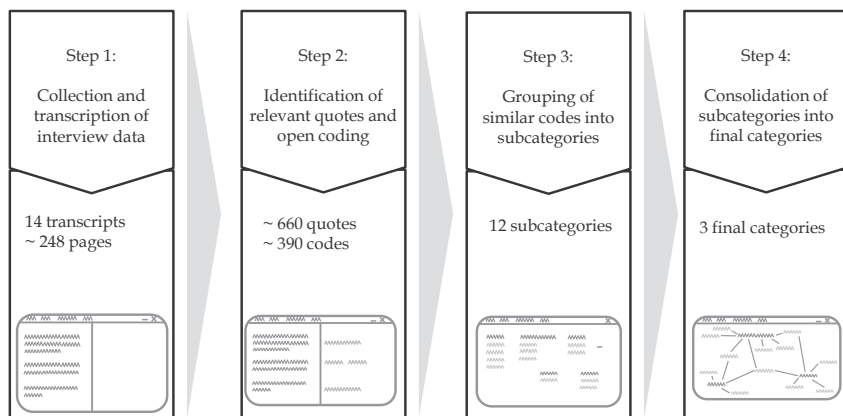
Figure 9: Steps of qualitative data analysis in part III[152]

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[148] Qualitative data analysis (QDA) was performed with software provided by ATLAS.ti Scientific Software Development GmbH (2012).

[149] Eisenhardt (1989); Miles and Huberman (2009)

[150] Glaser and Strauss (1967)

[151] Yin (2009)

[152] Own illustration

4 Findings

This chapter details the findings of the empirical study. It is divided into two sections. Section 4.1 presents the six mass customization cases by providing a short description for each company. It emphasizes the characterization of the respective customer co-design process along its basic elements (*4.1 In-depth Cases of Customer Co-Design*). Section 4.2 introduces the empirically derived key challenges which characterize the interplay between the process of *customer co-design*, customers' *perceived value* and the impact of *digital media* (*4.2 Key Challenges of Customer Co-Design*).

4.1   In-depth Cases of Customer Co-Design

4.1.1   Selve | Luxury Shoes

The German mass customizer selve offers **luxury custom shoes**, so far mainly for women. Since its foundation in the year 2000, customers have been able to choose from a huge variety of different shoe designs. The customers' choice comprises colors, materials and shoe shapes (e.g. boots, sandals, high heels or peep toe shoes). Customers receive a personal fitting service to find their individual foot measurements.

The entire **process of customer co-design** may be fully executed either in-store or online. Traditionally the majority of customers chose to inform themselves online and then to contact the shoe designer via phone to arrange an appointment in the showroom located in Munich. During this usually one-hour appointment, customers have an in-depth consultation with a professional shoe designer. Pre-configured shoes as well as the entire range of materials, colors and heel shapes are available for touch and feel. After agreeing on design, colors and materials, a systematic fitting with a pre-configured shoe from the prepared assortment is conducted. Depending on the desired shoe type, additional individual foot measurements are gathered manually or with the help of 3D hand-scanner technology. In order to decrease costs, selve developed a now patented size system which is more precise than the traditionally applied size system in the standardized shoe industry. The gathered data is then sent to the production site. Every produced shoe undergoes a quality check in Munich before it is finally prepared for pick-up in store or boxed for postal mail.

4.1.2   ErtlRenz | Sports Shoes

The German shoe individualizer ErtlRenz offers **customized sports shoes** for enthusiasts and people who do not fit into the standardized patterns of the sports shoe industry. One major part of the co-design process is the professional 3D-scanning solution, which allows exact individual foot measurements to be automatically gathered in-store.

The core of the **customer co-design process** typically comprises four basic steps. (1) The consumer is requested to select a store from the website and to contact the retailer by phone in order to arrange an initial personal appointment in the shop. (2) During the first appointment, the consumer receives an in-depth consultation with professional sales personnel trained in the sports equipment industry, and the foot measurements are gathered with the help of the professional scanning solution. ErtlRenz's purpose-developed 3D scanning solution consists of an approx. 2 by 2 meter platform which is administered via a closely located computer. Customers need to put on specific socks, which provide orientation for the sensor, which turns around once for both feet. This process allows the provider to visualize the exact foot shape on the computer screen as well as to convey the accuracy of the scan process. Further on, the measurements are mapped onto basic shoe shapes available for customization. Spots for individual adaption within the production process are identified and marked. (3) A second appointment takes place, during which the pre-produced boots are adjusted and fine-tuned. (4) Shoes are finalized and customers receive final advice on the appropriate handling when picking them up from an ErtlRenz store of their choice.

4.1.3   Spreadshirt | T-Shirts & Apparel

The Leipzig-based company Spreadshirt AG[153] is Europe's largest producer of **customized t-shirts and apparel**. As one of the first large-scale mass customization companies in Europe, Spreadshirt has risen steadily from its modest beginnings in 2002 to currently around 450 employees working at production sites in Germany, Poland and the United States.

The most crucial part in the **customer co-design process** is the online configuration toolkit which is internally called *confomat*. As one of the interview partners explained, there are two main pathways via which customers purchase custom apparel from spreadshirt. About 50% of customers buy their products from

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[153] Website for German speaking users accessible via www.spreadshirt.de

so-called spreadshirt-shops, i.e. t-shirt shops. These partner shops typically embed the spreadshirt online services into their own web presence and offer pre-selected products, which are arranged, i.e. designed and customized, by the respective partner. Hence these end customers do not necessarily experience an own co-design process, as this process has already been carried out by the partner shop.

The other half of the customers use the online toolkit to co-design their individual custom products. This online process typically exhibits three elements. (1) The customer chooses the basic product category, i.e. t-shirt or bag. (2) Customers may select an illustration or upload an image to be placed on the product by adapting its dimensions and position, i.e. front or back. Additionally, the customer may add an individual message through a text editor. (3) Customers proceed to the check-out process, i.e. purchase and payment. In the backend Spreadshirt then operates various processes for quality assurance (i.e. correcting typos) and IP rights infringements (i.e. company logos) and corresponds with the customer if changes are necessary. After 3 to 5 days, the product is delivered by postal mail.

4.1.4   DeinDesign | Design Skins

The company DeinDesign started its online customization service in 2006. It offers customers the option of creating their own **design skins** for a huge variety of electronic devices, such as mobile phones, tablets or notebooks. The skins are made of vinyl sheeting with an exact fit to the device.

Typically, when customers enter the website to create their individual skin, they are already aware of the basic **co-design concept**, as the founder mentions. Hence the need for further explanation on the homepage is fairly low. In a first step, customers select the device for which they are seeking an individual skin from a prepared selection. This selection is supported by filtering mechanisms. DeinDesign focuses on frequently bought, standardized products. In a thorough preparation process, DeinDesign ensures that all ordered skins exactly match the dimensions of the selected object. Hence customers don't need to worry about the physical dimensions of their products. In a second step, customers decide whether to choose from a pre-defined selection of skins (which includes professional illustrations or well-known brand logos), or to individually create their own design with the help of the online toolkit. Every such individually designed skin is approved manually by DeinDesign upon completion of the purchase. Finally, the design, including information on how to optimally stick it to the surface of the chosen product, is sent to the customer.

4.1.5   DreiGuerteltiere | Belts

The mass customizer DreiGuerteltiere offers **customization of belts** made of fabric or leather in a characteristic three-striped design. The production is carried out in a charitable workshop in Munich which guarantees quality and speedy delivery within a few days.

As the founder and CEO mentions, about 60% of customers enter the online belt designer and create their individual design. This simple design tool allows customers to choose from three basic belt categories, i.e. two-stripe or three-stripe belts as well as two-stripe leather belts. Further on, users may choose the colors, the clasp as well as the size. All in all, about 15 parameters are available for individualization. One typical challenge in the co-design process, as mentioned by the interviewee, concerns the size: customers who are used to standardized leather belts tend to systematically underestimate the size needed for fabric belts. Hence, the company focuses its development effort on simple and clearly defined information which allows customers to appropriately adapt the desired belt size. Besides the individual design of belts via an online interface, DreiGuerteltiere sells pre-designed belts in larger amounts through offline channels e.g. via retailers such as Peek & Cloppenburg as well as to corporate clients who often use these belts as presents or event gimmicks.

4.1.6   MyParfuem | Fragrance

MyParfuem is a rather unique example in the broad field of mass customization. The company offers **custom made fragrances in individualized flacons**. Founded in 2008, the internationally renowned company exclusively offers its service via the internet.

Its **customer co-design process** offers two different pathways as the founder explains. One way of co-designing is comparable to the majority of online co-design cases. Customers enter the website and move through the design process along initial questions (e.g. the recipient's sex and the character of the fragrance) followed by the selection of up to 6 out of 45 scents (e.g. bergamot, musk or amber). MyParfuem constantly seeks helpful adaptations of this gradual selection process, because the product itself comprises a comparably high level of complexity as the founder and CEO mentions. As a consequence, MyParfuem constantly tries to improve the selection mechanism in order to best support customers in creating the desired fragrance and reducing the risk of unwanted creations. As an alternative to

this solution-based co-design process, MyParfuem offers a needs-based approach. During this process, customers answer illustrative questions and finally receive a set of recommended fragrances.

The difference between the two approaches concerns the type of information and design competence that is required from the customer. The solution-based co-design process supports the customer by gradually simplifying the decision about the right mixture of scents. It yields a complexity that a non-expert can cope with. The needs-based process is designed to elicit customers' personal needs as thoroughly as possible. This information is then used by professional fragrance designers who compose the individual fragrance. Both co-design processes consist of seven steps. They end with the personalization of the flacon, which allows customers to input their own text and to adapt the visualization through provided images or uploaded pictures.

4.2   Key Challenges of Customer Co-Design

The in-depth analysis of the six cases under study revealed three key challenges of customer co-design. Each key challenge addresses one pivotal impact of digital media on customers' perceived value within the process of co-design. They are introduced in more detail below. The exploration of these challenges is grounded in data by providing appropriate anchor quotes from the expert interviews and the customer focus groups.

The first challenge (*Encouraging Discovery*) considers the impact of digital media on the ability of the customer co-design process to encourage discovery and increase perceived value through choice. The second challenge (*Fostering Creativity*) addresses the impact of digital media on the ability of the customer co-design process to foster a perceived value of creative achievement and pride of authorship. The third challenge (*Facilitating Reinforcement*) deals with the ability of digital media to strengthen enjoyment through mechanisms of reinforcement within the co-design process.

4.2.1   *Encouraging Discovery*

Encouraging customers to discover the potential solution space in the process of co-design is identified as one key challenge. Mass confusion, burden of choice, and cognitive stress are identified as relevant components of perceived costs in processes of customer co-design. All of these concepts relate to the phenomenon that on the

one hand, customers prefer more choice, but on the other hand, they may get confused if too much choice is available. Hence a co-design process which is capable of overcoming this paradox may increase customers' overall perceived value.

The current study adds an important finding to this paradox of choice. The data indicates that customers who explore the solution space with the help of digital media, such as an online toolkit, seem to have less awareness compared to those who explore the solution space with the help of non-digital media, such as samples and catalogs. The solution space is a technical term to describe the entire amount of potential product designs, which may be specified by the customer. In all six cases, the solution spaces comprise a comparably high number with up to millions of possible adaptations and thus design specifications. It can be derived from the data that customers who explore the product design options in-store or by catalog seem to have a greater awareness of the entire solution space. Concerning in-store exploration, various quotes consider the possibility of touch & feel as well as human contact to be the most relevant elements in increasing solution space awareness. Through this mechanism, exploration seems to be fostered as the manager of selve reports:

> "New design options are available online and are frequently announced via newsletter. But still, it is much easier to present the entire variety of design options in-store through interpersonal communication."[154] (Expert Quote 9:333)

Further on, the data reveals that customers seem to discover more choices within the process of co-design when looking at a catalog.

> "Last year we distributed a catalog for the first time, which we saw circulating quite well, for new customers as well as existing customers, and which resulted in the effect that people suddenly started to order totally different products, not only the figurehead product. […]. So this is something which definitely impacts the stage of exploration."[155] (Expert Quote 5:20)

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[154] Quote translated by the author; original German quote: „Und natürlich stellen wir neue Sachen auf die Website und wir machen ja auch immer wieder Newsletter mit Neuigkeiten und so weiter und trotzdem ist es so, dass man hier einfach irgendwie mehr an Varianten zeigen kann oder mehr an Optionen persönlich vermitteln kann.

[155] Quote translated by the author; original German quote: „Wir haben im letzten Jahr zum ersten Mal einen Katalog herausgegeben, wo wir festgestellt haben, dass der auch ganz gut zirkuliert, also sowohl bei Neukunden als auch bei Bestandskunden eine gewisse Wirkung hat und vor allem dafür sorgt, dass die das Thema entdecken, in der Mitte hier, plötzlich eine ganz andere Gewichtung bekommt, dass die Leute plötzlich anfangen, ganz andere Artikel zu bestellen und eben nicht nur das

The reasoning behind this observation may be that catalogs provide a different presentation of potential product designs compared to an online toolkit or a product gallery on the web. Within catalogs products are typically presented in a human context. Customers, for their part, report that catalogs are more convenient compared to e-mail newsletters. Social presence theory delivers a reasonable explanation for this key observation. Digital media with a higher social presence seem to foster discovery in the process of co-design. Human contact, if direct (in-store) or indirect (catalog), incites customers to discover the unexpected. Discovering and exploring options of choice is a fundamental requirement to be aware of the potential solution space in terms of degrees of freedom.
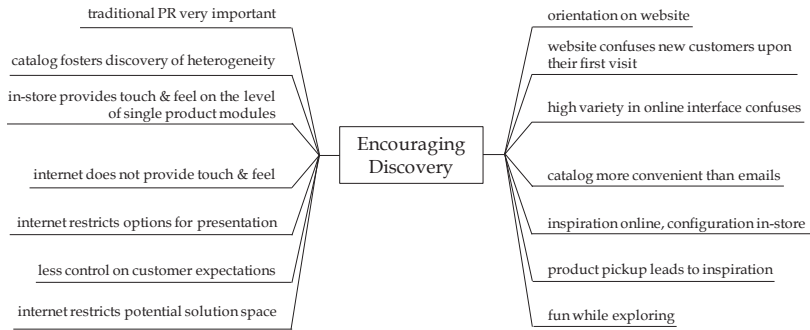
Figure 10: Exemplary codes which yield the challenge of encouraging discovery[156]

4.2.2   *Fostering Creativity*

Creative achievement and pride of authorship are identified as value creating components of the process of customer co-design. The in-depth data analysis reveals that digital media tend to foster customers' perception of creative achievement and pride through various mechanisms. The data indicates that customers in-store do not necessarily experience the feeling that they have created something new. Instead, they attribute the process of co-design and creation to the sales representatives or the business concept of the mass customizer. In the online

klassische [Produkt][…] Und das sind so Sachen, die quasi schon auch das Entdecken-Feld beeinflussen."

[156] Own illustration

environment, customers are forced to control the design process on their own. The data indicates that customers tend to perceive the feeling "I created it myself". It may be argued from the analysis that this impact may be explained by applying digital media to customer co-design. Two mechanisms are frequently mentioned in this context. This is customers' perceived control over the co-design process as well as the fact of anonymity.

> *"And I simply realize, that this "may I help you" or "are you searching for something specific", that this actually prevents you from being self-creative and to combine colors, which you would never buy, just to see how stupid this looks."[157] (Expert Quote 13:043)*

Both mechanisms can certainly be observed to a large extent in the online co-design cases. However, whether the co-design process takes part online or in-store, the impact of digital media on customers' perceived value in terms of creative achievement as well as pride of authorship can be identified as the interview data reveals. Even when co-designing products in-store, customer value perception in terms of creative achievement profits from active control, e.g. via an iPad solution.

anonymity enables self-creative actions		online inspiration prior in-store purchase
Intrusiveness is negative		train customer creativity in-store
Creativity step-by-step		no individual creation in-store
Playfulness vs. step-by-step	Fostering creativity	online playfulness
less individual creativity		creative feeling in self-design
playfulness of customer inhibited in-store		product pride – photo on facebook

Source: expert interviews   *Source: customer focus groups*

Figure 11: Exemplary codes which yield the challenge of fostering creativity[158]

In addition, the customer focus groups indicated that full control over the design process by the sales representatives may be perceived as kind of negative dictation.

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[157] Quote translated by the author; original German quote: „Und ich merke dabei einfach, dass eben diese, was ich gerade sagte, dieses kann ich Ihnen helfen oder suchen Sie was bestimmtes, dass das eigentlich einen total davon wegdrängt, selbst kreativ zu sein und sich vielleicht auch mal die vielen Farben zusammen stellen, die man niemals kaufen würde, um einfach mal zu sehen, wie blöd das ist."

[158] Own illustration

In order to prevent this effect, customers in one case received touch-screen interfaces (e.g. tablets such as an iPad) within the shop environment to gain more control over the design process. A manager of this company stated:

> "*Customers who can engage with our in-Store iPads to create their own designs profit from fast trial & error learning and seem to gain a better understanding about their current status in the co-design process*"[159] *(Expert Quote 3:86)*

If mass customizers provide the possibility to hand over preliminary product designs to customers and allow them to take their own actions, e.g. change colors or get acquainted with their own foot measurements, the perception of having created something new increases. The mechanism of "do-it-yourself", which is actually prevalent in the online environment, is then transferred to the in-store process.

4.2.3   *Facilitating Reinforcement*

Further, it can be derived from the analysis, that customers require mechanisms of reinforcement to proceed in the process of co-design. The analysis reveals that

> "*For me the internet can provide a rough indication, of how things might look, it provides a certain playfulness, but after a certain time I stopped doing it because the combination possibilities are very limited and it wasn't fun to proceed in the configuration.*"[160] *(Customer Quote 1:40)*

As the statement shows, positive reinforcement – here in the form of fun – is important and at the same time contingent on the employed media. For mass customizers it becomes the challenge of *facilitating reinforcement* in customer co-design. This finding is in line with Turner et al. (2012), who argue that

> "*toolkits should be designed with features that enable the user to obtain feedback about the co-design process and positive reinforcement.*"[161]

The authors, however, differentiate two fundamentally different mechanisms of incorporating reinforcement into the process of co-design. The first relates to the

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[159] Quote translated by the author; original German quote: „Dass sich dann zwei, drei Kunden schon mit Ihren iPads beschäftigen können und schon mal anfangen können, ein Design zu machen, nachdem ihnen das Konzept erklärt wurde, und dann, sobald ein Kunden abgefertigt ist quasi, kann der nächste gleich dran. Und dann weiß er schon ein bischen mehr, wo er gerade steht, und dann kann man anhand des Designs am iPad noch mal drüber reden."

[160] Quote translated by the author; original German quote: „Und das Internet kann für mich ein Indiz sein, wie die Sachen aussehen können, es macht Spaß, daran ein bischen rumzuspielen, aber ich habe es dann irgendwann auch nicht mehr gemacht, weil die Kombinationsmöglichkeiten sehr eingeschränkt waren und das auch keinen Spaß gemacht hat, da irgendetwas zusammen zu stellen."

[161] Turner et al. (2012)

idea of trial and error, which is typically realized via immediate interaction through the digital medium, e.g. configurators on a website. Especially in the online environment, online tools are provided, which realize instant visualizations after each change made by customers. This mechanism may also be realized in-store, as the co-design cases of selve and ErtlRenz show, where screen and tablet solutions provide instant digital feedback through visualization for customers and the responsible sales persons.
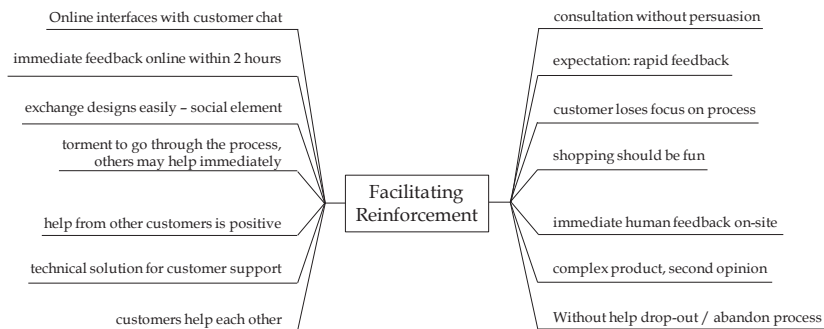
Source: expert interviews   *Source: customer focus groups*

Figure 12: Exemplary codes which yield the challenge of facilitating reinforcement[162]

The second and, according to the number of mentions, more important mechanism to meet this challenge involves reinforcement through interpersonal feedback via human interaction. As the data reveals, this mechanism of reinforcement is predominantly realized through in-store sales persons in the cases of selve and ErtlRenz. Further, it can be observed within those two cases, that customers are usually not alone. They are supported by their families and friends to gather feedback.

> *"Especially at a [provider], where you have so many options, one needs an additional second opinion, I believe."[163] (Customer Quote 4:84)*

Thus reinforcement through human interaction may not only be provided by sales persons but also by other people, such as friends or peer users. In the online co-design cases of Spreadshirt, DeinDesign, 3Guerteltiere and MyParfuem, experts

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[162] Own illustration

[163] Quote translated by the author; original German quote: „gerade bei [Provider], wo man halt so viele Möglichkeiten hat, braucht man, glaube ich, noch ein, zwei Meinungen."

report that media for direct or indirect human support are provided, e.g. a hotline, e-mail address, contact form, social media. These media are rarely used by customers to gather feedback on their preliminary designs. Customers use them to a much higher rate for inquiries concerning payment and delivery, but not during co-design activities. However, managers from online co-design cases support the idea that more reinforcement through human interaction may decrease the risk of postponement or even abandonment and are thus likely to increase conversion rates. In line with this idea, customers argue that they would need more opportunities for consultation while designing products online. As a consequence, the present study implies that digital media for co-design tend to fail in providing the "second opinion" customers often need to proceed with their co-design activities. Furthermore, the study strengthens the argument that reinforcement through human interaction is a substantial driver for perceived enjoyment. Such interaction may be provided by sales professionals, friends or design professionals. From the analysis it can be derived that digital media for co-design tend to neglect mechanisms of human reinforcement and thus may limit perceived enjoyment.

5 Conclusions and Future Research

In this study three key challenges of customer co-design were identified, in response to the proliferation of digital media in the context of mass customization from a customer perspective. The first challenge considers the ability of the co-design process to further the discovery by customers of the product solution space. The collected data revealed that customers who engage in media with a higher social presence are more likely to discover unexpected product adaptations. It seems that digital media with a lower social presence tend to have a limited discovery yield and thus lower the perception of the potential solution space. When customers felt that they were not aware of the potential solution space, they perceived less value. In addition, managers reported that the variety of individualized products purchased substantially increased after introducing a new medium with a higher social presence. This finding is related to two other effects. For one, serendipity, defined as discovering something that was initially not looked for, has been shown to be a driver of creativity and innovation.[164] As being creative and creating something new are also drivers of perceived customer value in co-design,[165] serendipity may serve as a reinforcing mechanism of creativity in co-design processes. This finding relates to the research on the mass confusion problem in customer co-design.[166] Future research needs to consider the effects of the applied medium on customers' perception of the solution space. Responses to this challenge focus on two areas. On the one hand, it is argued that online providers need to develop new mechanisms, e.g. with the help of reader communities, to foster discoverability. On the other hand, it is argued that physical stores need to be protected and strengthened, because they are not affected by the discoverability issue.

The second challenge is the ability of the co-design process to foster the beneficial value components of creative achievement and pride of authorship[167]. Our analysis indicates that digital media, which allow customers to retain control over the co-design process, tend to foster these value perceptions. The rationale behind this is that media with a lower social presence encourage customers to carry out their own

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[164] Austin, Devin and Sullivan (2012)

[165] Franke and Piller (2003); Schreier (2006); Merle et al. (2010)

[166] Piller et al. (2003); Piller et al. (2005)

[167] Franke and Piller (2003); Schreier (2006); Merle et al. (2010)

creative activities in a process of fast trial & error. Online interfaces may fully profit from this mechanism, as they typically pass the control over the co-design process to the customer. However, future research needs to consider in-store processes for this mechanism of value creation. Our analysis revealed that customers who experienced a co-design process in-store with the support of a sales representative tend to perceive less creative achievement. Future research should therefore focus on how digital media can enrich in-store processes by providing opportunities to foster the feeling of creative achievement and pride of authorship.

The third challenge is the ability of the co-design process to facilitate reinforcement through human interaction. The analysis revealed that co-design is generally perceived as a intensive process. Throughout this process customers need to make many decisions. It is likely that moments of uncertainty will occur. Human and social contact, either with sales personnel, friends or other peer users may help to reinforce the customer with a second opinion of their own decision. Furthermore, human contact was frequently perceived as a factor which increased enjoyment. Digital media in purely online environments are weak in supporting this mechanism. It is argued that media with a higher social presence encourage customers to request personal support. Customer co-design in-store may profit from easy and direct access to personal support in contrast to the online environment. Future research needs to consider how online co-design may be enriched with mechanisms of reinforcement through human contact in order to increase the perceived value of enjoyment. Table 4 summarizes the key challenges of customer co-design, provides an explanation and displays avenues for future research.

Table 4: Key challenges for customer co-design and future research directions

Challenge	Explanation	Impact of digital media on customers' perceived value	Social Presence Theory	Future Research Direction
Encouraging Discovery	Customers need to be served with media which foster identification and exploration of the individualization offer.	Digital media tend to have limited discovery yield for individualization offers in general and solution spaces for co-design in particular	Media with a higher social presence encourage discovery of the unexpected – something that customers didn't initially search for	Understand how combinations of media enhance serendipity.
Fostering Creativity	Customers need to be served with media which allow for creative activities.	Digital media for co-design tend to foster the perceived value of creative achievement;	Media with a higher social presence prevent customers from being self-creative	Understand how digital media may enrich in-store co-design processes with opportunities for delivering the feeling of creative achievement to the customer.
Facilitating Reinforcement	Customers need to be served with media which facilitate reinforcement through human interaction.	Digital media for co-design tend to neglect the "second opinion" (friends, peers, professionals) and thus limit the possibilities for positive reinforcement	Environments with a higher social presence make it easier for customers to request and receive personal support	Understand how digital media based co-design processes may be enriched with reinforcement opportunities through easy access to human interaction.

Part IV – Empirical Study 2: Online Customer Co-Design

Structured Abstract

Needs/Goals: Prior studies in online mass customization have addressed the challenge that customers often require positive reinforcement before they finalize a preliminary design and purchase the product (Piller et al. 2005; Delleart & Dabholkar, 2009; Franke et al., 2010), with various mechanisms being proposed (Turner et al., 2012). Yet an understanding of how these mechanisms are facilitated from an interactive media perspective is lacking. Thus the goal of this study is to explore mechanisms of interactive media, which facilitate positive reinforcement in customer co-design.

Theoretical Underpinning: Besides the feedback a customer may perceive through the online toolkit, i.e. via trial & error, Turner et al. (2012) identify two major sources for social interaction in online customer co-design. The first source is interaction with peers and users from online communities (Franke et al. 2008). The second source is the interaction with salespersons from the mass customization business (Dellaert & Dabolkar, 2009). A remarkable difference in online media for interpersonal communication is the level of richness they provide (Palmer, 2002). Thus the theory of media richness is introduced to characterize the different levels of social interaction.

Method/Data: The study follows a multiple-holistic case study approach. 115 online mass customization cases were selected for a large-scale, cross-case analysis of their respective interfaces for online co-design. Data were collected through intensive screening and testing of co-design interfaces by multiple investigators. Subsequently, a systematic identification of underlying mechanisms and dominant approaches across the cases was performed.

Findings: Online media for customer co-design may be characterized in two different ways. The first, *shareability of design,* refers to the extent to which the preliminary design itself is shareable with other individuals e.g. friends, design professionals or salespersons. The second, *interpersonal presence,* refers to the extent to which the customer perceives the co-design partner to be present. The analysis reveals two dominant approaches, i.e. social and live customer co-design.

Conclusion/Future Research: Future research needs to investigate the impact of these approaches on customers' perceived value in order to determine the theoretical and managerial implications for mass customization businesses.

1   Needs and Goals[168]

> *"True interactivity is not about clicking on icons or downloading file;*
> *it's about encouraging communication."*
>
> – Edwin Schlossberg[169]

Creating attractive processes for customer co-design is key to successful online mass customization businesses.[170] One specific challenge for businesses is to facilitate the appropriate level of social interaction to each single customer, as outlined in part III. This is necessary because social interaction is expected to yield positive reinforcement, which in turn influences customers' perceived value and thus their willingness to finalize their design:[171]

> *"Customers often need to be able to save their configurations, discuss them*
> *with others, share them with others, and let other people provide input or*
> *changes, before they finalize their designs."*[172]

Besides other aspects, the level of social interaction is dependent upon the characteristics of the online medium applied for the co-design process. Within traditional customization settings, where customers co-design products inside physical shops, social interaction is realized through non-mediated, direct, face-to-face contact with sales personnel and friends or close ones.[173] However, running a physical shop and employing sales people entails comparably high operational costs. Thus many mass customizers nowadays decide to operate their businesses in the online environment, i.e. by relying on electronic commerce.[174] Current market

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[168] An earlier version of part IV was submitted to the 7th research seminar on innovation and value creation as Thallmaier (2012). The study reported in part IV is currently further developed in collaboration with Dr. Hagen Habicht and Prof. Dr. Kathrin M. Möslein for submission as a journal paper. Key results of the study are also summarized as a transfer report for the German brochure *Produktindividualisierung im Einzelhandel*. This transfer report is co-authored by Dr. Hagen Habicht and Prof. Dr. Kathrin M. Möslein as Thallmaier, Habicht and Möslein (2014).

[169] Edwin Schlossberg is an American founder, designer and author of the book "Interactive Excellence: Defining and Developing New Standards for the 21st Century"; Schlossberg (1998)

[170] Piller and Berger (2003)

[171] Yoo, Lee and Park (2010)

[172] Seybold (2006)

[173] Goswami, Tan and Teo (2007); Monsuwé, Dellaert and Ruyter (2004)

[174] Walcher and Piller (2012)

data undoubtedly reveals the relevance of online interaction for commerce, regardless of where the customer fulfills the final transaction of purchase. However, it is also recognized that the online environment to date has exhibited a comparably deficient interactive medium for customer co-design.[175] This fact is mainly attributed to the lack of rich and real-time individual interaction, as customers are frequently prompted to engage in an isolated communication with their own electronic device and the website of the mass customization provider.[176]

Hence in a typical online customization context, interaction with a human, i.e. sales person or friend, is fully replaced with a configuration toolkit for self-design and additional help information, e.g. FAQs.[177] Customers who exhibit a relatively low *need for interaction* will potentially seek such interfaces and select the interfaces for their purchase decision according to usefulness, ease of use and enjoyment.[178] However, customers who exhibit higher levels of *need for interaction* will potentially avoid such interfaces or abandon their design activities[179] and seek out alternative options.[180] Hence mass customizers relying on online interfaces risk losing potential customers if they neglect the latter kind. To overcome this risk, mass customizers may develop and provide interactive media to compensate for the lack of social interaction via face-to-face contact, because:

> "*The purpose of facilitating interactive features on the e-commerce website is to increase consumers' perceived consumption value and, in turn, to satisfy and retain them.*"[181]

However, the research conducted to date has lacked a clear understanding of interactive media in online customer co-design for three reasons. First, studies on co-design in mass customization have merely focused on the isolated interaction with the toolkit itself, i.e. usability and realistic visualizations, to overcome potential burdens such as customers' perceived uncertainty or perceived complexity. These research and development efforts are frequently pursuing the ideal typical toolkit, which fosters customers to engage in a self-design process while neglecting the role of human support. [182]

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[175] Yoo et al. (2010)

[176] Franke et al. (2008)

[177] Monsuwé et al. (2004)

[178] Monsuwé et al. (2004)

[179] Piller, Vossen and Ihl (2012)

[180] Dabholkar and Bagozzi (2002)

[181] Yoo et al. (2010, p. 89)

[182] Gerber and Martin (2012)

>*"Therefore, additional research effort is needed to analyze and evaluate collaborative online shopping technologies theoretically and empirically to advance the IS knowledge concerning this important and expanding buying channel"[183]*

Second, to date the online channel has frequently been interpreted as a valuable opportunity for businesses to reduce costs by turning traditional services into self-service.[184] Hence research often purposefully focuses on automating most customer processes, which typically include

>*"…automated catalogs, automated negotiation, automated purchasing support, automated customer query answering services, and comparison shopping."[185]*

Third, previous research into customer co-design has focused on the general idea of supporting social interaction, e.g. through concepts such as *collaborative customer co-design*[186], *social toolkits*[187] or *sales people interaction*[188]. However, these studies have stayed on a rather abstract level (e.g. simply adding social media buttons) and have not investigated the online co-design processes or the features of interactive media on a more fine-grained level. To bridge this gap in research, this study answers the following research questions:

>*RQ1: What mechanisms of interactive media facilitate positive reinforcement through human interaction in online customer co-design?*
>
>*RQ2: What are the dominant approaches for facilitating positive reinforcement through online media in customer co-design?*

To answer both research questions, the remainder of the study is structured the following way. *Chapter 2* presents further theoretical underpinnings from literature on the feedback mechanisms and introduces the link to media richness theory. The subsequent *chapter 3* presents the method and data used to carry out the large-scale cross-case analysis. *Chapter 4* focuses on the findings of the analysis, presents the identified types of online customer co-design systems and derives the appropriate design parameters. Finally, *chapter 5* summarizes the study, discusses its limitations and presents avenues for further research.

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[183] Zhu, Benbasat and Jiang (2010, p. 873)

[184] Moon, Lee and Lee (2000)

[185] Moon et al. (2000, p. 213)

[186] Piller et al. (2005)

[187] Piller et al. (2012)

[188] Dellaert and Dabholkar (2009)

2 Theoretical Underpinning

"It is the theory that decides what we can observe."

– Albert Einstein

This chapter introduces the theoretical underpinning for the present empirical study. Recently, customer co-design has been intensively investigated in the online mass customization context.[189] Müller (2007) argues that this development is strongly related to the potential and the diffusion of the internet, which enhances product individualization through online media and direct customer integration. Moreover, providers argue that the online context allows to decrease the costs of the transaction to be decreased and efficient processes of co-design to be built.[190] Lee and Chang (2011) even argue that the

> *"use of the Internet is considered necessary in customizing products in that it has allowed effective and spontaneous communication between company and consumer"*[191]

One important element of online media for customer co-design is toolkits. Online toolkits allow customers to take control over of the design process and concurrently enable mass customizers to control transaction costs.[192] Customers may apply the online toolkit to choose from a range of options available for the desired product and proceed to the check-out. Within this process, various technically- and socially-induced feedback mechanisms are provided to facilitate positive reinforcement. The major risk providers face is that customers, for any given reason, abandon their design activities, leave the process and don't return.[193] Thus the appropriate design of online toolkits is an important aspect for the success of mass customization businesses.

The various online feedback mechanisms, which are expected to yield positive reinforcement in this design process, are introduced below. These mechanisms are

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[189] Piller et al. (2005, p. 7); Dellaert and Stremersch (2005); Franke and Piller (2004); Kamali and Loker (2002); Dellaert and Dabholkar (2009)

[190] Müller (2007)

[191] Lee and Chang (2011, p. 171) based on Anderson (2008); Hibbard (1999); Kim (2002)

[192] Franke and Piller (2004)

[193] Dellaert and Stremersch (2005)

supported through different online media. A remarkable difference in online media is the level of richness they provide. Therefore the theory of media richness will be introduced.

2.1   Mechanisms of Feedback in Co-Design

As stated previously, supporting customers through feedback is supposed to add value to the customer co-design process. However, the sources of feedback vary fundamentally in their basic characteristics. This fact can be stated when reviewing and comparing examples in the mass customization practice, e.g. the cases of spreadshirt and selve. Turner et al. (2012) deliver a meaningful differentiation of feedback sources through their synthesis of extant literature focusing on: *How to increase the value of a co-design experience*.[194]

The authors primarily differentiate between *embedded* and *interpersonal* feedback, basically taking account of the fact that feedback may be induced and facilitated technically or socially. According to the authors, embedded feedback is integrated into the toolkit and includes such elements such as trial and error or visualization. Interpersonal feedback emphasizes the social role, e.g. exchange, advice, help or assistance via interaction with other people. Here, the authors further differentiate between interpersonal feedback through from sales personnel and from peer users within certain communities.[195] Franke et al. (2008) empirically investigate each singular stage within the customer co-design process and conclude that feedback from a user community may positively impact the design process, specifically in the development phase, i.e. when the user creates an initial idea of the design, as well as in the evaluation phase, i.e. when the customer finalizes the design specification according to his or her needs.

The idea of differentiating between *embedded* and *interpersonal* feedback directly relates to the discussion on interactivity in the online context. As Rafaeli and Yaron (2007) note, interactivity has been defined differently depending upon the research perspective and field of inquiry.[196] The latter authors for example refer to the process-related perspective in the field of computer-mediated research. From this discussion, it can be derived that interactivity is a frequently applied notion in academia as well as in practice, especially in terms of online communication. Bucy

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[194] Turner et al. (2012)

[195] Franke et al. (2008)

[196] Rafaeli and Ariel (2009)

and Tao (2007) note that interactivity in the online context exhibits specific facets and thus requires a different treatment compared to the 'offline' context.[197] Yoo et al. (2010) note:

> "*The nature of e-interactivity including both computer mediated interaction and media interaction is different from offline interactivity, which is mainly based on face-to-face interaction.*"[198]

On an abstract level interactivity is generally perceived as an inherent element of the internet and its various media; thereby it is frequently attributed with positive effects if the degree of interactivity rises, i.e. for e-learning environments or customer purchase intentions.[199] However, Fortin and Dholakia (2005) cite interactivity as a typical 'buzzword' which is 'hyped' in the press as well as in professional journals.[200] This is especially observable in research into new forms of co-creation, i.e. customer co-design, which nowadays rely to a certain extent on new communication technologies.[201] The relevance of interactivity in the e-commerce context, such as in online customer co-design in mass customization businesses, has been widely acknowledged and has attracted a lot of interest as researchers and practitioners increasingly emphasize its importance in website design.[202]

However, researchers argue that a major problem occurs through the often neglected differentiation between interaction with a technical device, and interaction with a person by way of a technical device.[203] Therefore Zhenhui et al. (2010) make a distinction between mechanical interactivity and social interactivity in online shopping. In the same vein, Stromer-Galley (2004) differentiates between interactivity-as-product (user interaction with technology) and interactivity-as-process (human interaction).[204] Accordingly, Leiner and Quiring (2008) use the notions of 'user-to-system interactivity' and 'user-to-user interactivity.[205] User-to-system interactivity refers to the interaction between a user and a system, i.e. a website. User-to-user Interactivity refers to the interaction between two or more users, which is fostered through technology, i.e. the web. Therefore the exchange

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[197] Bucy and Tao (2007)

[198] Yoo et al. (2010, p. 90)

[199] Zhenhui, Jason, Bernard and Wei (2010)

[200] Fortin and Dholakia (2005, p. 388)

[201] Kiousis (2002)

[202] Yoo et al. (2010); Yadav and Varadarajan (2005)

[203] Zhenhui et al. (2010)

[204] Stromer-Galley (2004)

[205] Leiner and Quiring (2008)

may occur synchronously, i.e. at the same time (through text or voice chat) or asynchronously, i.e. at various points in time (e.g. via e-mail or on a forum).[206] However, this differentiation is of high relevance, as the type of interactivity may have a major influence on customers' perceived value of co-design activities. Or, as Piller et al. (2005), based on Kamali and Loker (2002), argue:

> "*Controlling for the level of channel knowledge and use, increased interactivity provided by design involvement motivated consumers to purchase and may increase the willingness to pay*"[207]

However, a deep understanding of this complex construct is still lacking as Zhenhui et al. argue (2010).[208] The latter authors state that past research has frequently investigated interactivity as a singular dimension and has doubtlessly identified relevant relationships. However, those studies failed to study interactivity on a more granular level to better understand this complex and multi-faceted construct and its effect on customer perceptions and purchase intentions. Further on, the authors argue that these studies are fundamental for producing relevant guidelines for practitioners in terms of website design. Yoo et al. (2010) tried to fill this gap in research and investigated the impact of interactivity on perceived value. In their respective study the authors differentiate interactivity along the three dimensions of controllability, bi-directionality and synchronicity.[209] On the basis of the analysis, they conclude that higher levels of bi-directionality foster hedonic value perceptions, while higher levels of synchronicity impact utilitarian value perception. Bi-directionality refers to the social facet of interactivity and covers the degree to which a website offers users the possibility to contact sales representatives directly. Synchronicity refers more to the technical facet of interactivity which covers the question of how fast the website responds to customer input.

2.2   Media Richness Theory

As Aurora et al. (2008) and Turner et al. (2012) emphasize, interactive media for customer co-design should provide human feedback mechanisms which enable customers to "*learn from the experience of others*" and thus receive positive

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[206] Bucy and Tao (2007); Kiousis (2002); Suh and Lee (2005)

[207] Piller et al. (2005); Kamali and Loker (2002)

[208] Zhenhui et al. (2010, p. 35)

[209] Yoo et al. (2010)

reinforcement on their progress.[210] A remarkable difference in interactive media for interpersonal communication is the level of richness they provide.[211] The concept of richness and thus the link to media richness is frequently found in conceptual as well as empirical studies investigating the online consumer context.[212]

The theory of media richness was initially introduced by Daft and Lengel (1986).[213] It has been developed within an organizational context investigating the behavior of managers in terms of media choice.[214] The theory differentiates media along the dimension of richness, which is - unlike social presence - a multi-dimensional construct. The theory assumes, that the task, i.e. co-designing a product, may be differentiated and characterized in terms of uncertainty and equivocality. Hence the theory - in its basic understanding - distinguishes between *poor* and *rich* media due to their specific characteristics. It postulates that, depending on the nature of the co-design task, one medium will prove to be particularly useful. As Beck (2006) notes, the more cues a medium offers, the more it approaches traditional face-to-face communication and thus facilitates social interaction.[215] For example, video conferencing is typically considered to be a mode of *rich media* and this form is expected to prove appropriate for co-design tasks of high uncertainty and high equivocality. By contrast, *email* is frequently associated as a *poor* medium and should therefore be more appropriate for structured tasks, i.e. tasks of low uncertainty and low equivocality.

According to the authors, media richness is thereby a higher-order construct, which is based on the following four subordinated dimensions:[216]

- *Immediate feedback*: Media vary in their capability to allow communication partners to give immediate feedback or not. In face-to-face situations, the immediacy of feedback is perceived as very high, because people may instantly react, e.g. through facial mimic. In written communication via email, immediacy of feedback is lower, as the technical infrastructure first needs to process the communication.

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[210] Arora et al. (2008); Turner et al. (2012)

[211] Palmer (2002)

[212] Fortin and Dholakia (2005)

[213] Daft and Lengel (1986)

[214] Daft and Lengel (1983), Daft and Lengel (1986)

[215] Beck (2006, p. 51)

[216] Daft and Lengel (1986, p. 560)

- *Number of cues and channels*: The more cues and channels available, the higher the richness of the applied medium. It is argued that, in a telephone situation, voice and tone are additional cues which complement the verbal information, which is exchanged between the communication partners. Again, in written communication, fewer cues are available, although partners may express emotions through the use of emoticons.

- *Personalization*: This aspect considers the amount of personal information which can be transmitted through the use of the medium. Emotions can be named as one example. If the medium is able to transport more of that kind of personal information, it can be regard as *richer*.

- *Language variety*: The more natural language can be used, the richer the medium will be perceived. In a setting where communication partners may convey audiovisual information, the language variety is considered to be greater compared to a situation in which only written communication is allowed.

Based on empirical research Daft and Lengel (1986) elaborate the theory by developing the *model of media richness* which builds upon the differentiation between 'poor' and 'rich' media.[217] The authors propose a model which suggests a two-dimensional matrix of media richness and task complexity. The model proposes a corridor of fit, in which media richness meets the needs of the task characteristics. Outside of the ideal corridor of fit, the match between media richness and task characteristics will lead to oversimplification or overcomplication of the situational context.

As stated above, media richness theory was primarily applied in an intra-organizational context. However, few studies have verified its applicability to the e-commerce context.[218] Within this research stream, richness characterizes the ability of the interactive medium to exchange an understanding about the current situation and progress. In a situation where customers decide to request online feedback from other individuals – whether peers or salespersons – the medium needs to deliver the appropriate level of richness. This way it can be assured that the communication partners understand each other. Studies indicate that richer media (compared to poorer media) decrease coordination problems in situations where multiple individuals engage in a collaborative shopping process. It is also indicated that

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[217] Daft and Lengel (1983), Daft and Lengel (1986); Reichwald, Möslein, Sachenberger, Englberger and Oldenburg (1998, p. 57)

[218] Brunelle (2009); Fensel, Werthner, Brunelle and Lapierre (2008)

richer media increases the perception of social presence, which in turn is acknowledged as an important driver of perceived value.[219]

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[219] Zhu et al. (2010)

3 Method and Data

"It is a capital mistake to theorize before one has data."

– Arthur Conan Doyle, Sr.

The present chapter details the method and characterizes the empirical data investigated in the study. The method will be differentiated along the distinction of the overall research approach and the research design, which details the phases and research steps undertaken. Finally, the data are characterized to provide a brief overview of the empirical sample. Therefore, the present chapter is divided into three sections.

The first *section* introduces the overall research approach and justifies the application of an explorative and qualitative case study method *(see 3.1)*. The second *section* introduces the research design along the three major phases undertaken and details the operational research steps in separate *subsections (see 3.2)*. The third *section* finally introduces the empirical database and characterizes the sample of cases applied to the study by providing descriptive statistics and further in-depth information. To support this last section, selected cases from the sample are presented verbally as well as graphically with the help of screenshots *(see 3.3)*.

3.1 Research Approach

In order to explore the phenomenon of online co-design, a qualitative and thus explorative research approach is selected. The rationale for this selection is twofold. First of all, a qualitative approach makes it possible to answer research questions that intend to find out *what* new phenomenon are, *how* they occur or *why* they occur.[220] In this way, the approach adds new facets and aspects to the understanding of hitherto unknown or relatively new phenomenon.[221] Secondly, a qualitative research approach is an appropriate means to identify types of occurrences and to derive systematic typologies, which are of relevance to the phenomenon under

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[220] Creswell (2008)

[221] Eisenhardt (1989)

investigation.[222] Hence the qualitative research approach fits the needs of the present study, which aims to identify dominant approaches of online customer co-design and their systematic differentiation in the online context.

Various forms of qualitative research approaches exist. One frequently applied approach is case study research, in which researchers conduct an *in-depth analysis* to explore a certain phenomenon within its *real-life context*.[223] Hence case study research fits the needs of the present study as it enables customer co-design (*phenomenon*) to be explored within its real-life context (*online mass customization*) in order to identify a dominant approaches and an appropriate systematization by way of an (*in-depth*) analysis. The following aspects need to be considered when choosing a case study approach: (1) number of cases and (2) units of analysis. A very useful differentiation in this regard is delivered by Yin.[224] In order to distinguish various case study methods, she proposes the following four abstract approaches: (1) single-holistic, (2) multiple-holistic, (3) single-embedded and (4) multiple-embedded.[225] The approach selected depends on the objective of the study in question.

For the present study, a multiple-holistic case study approach is selected. Hence in each case which will be analyzed, one unit of analysis will be explored in-depth. With regard to the current study, this means that one case equals one mass customization provider. The unit of analysis is therefore the co-design process in the corresponding online context. In this way, the case study research makes it possible to iteratively analyze within a case as well as cross-case to identify approaches of customer co-design and derive an appropriate systematization. The following section will deliver a detailed explanation of each research phase and its respective steps.

3.2   Research Design

As mentioned in the previous section, the present study approaches the empirical field with a multiple-holistic case study design. To achieve this, the research design

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[222] Eisenhardt (1989)

[223] Yin (2009); It needs to be mentioned that the case study approaches proposed by Yin (2009) and Eisenhardt (1989) have major commonalities and are frequently referenced in common within management studies. Still, there are differences. Eisenhardt focuses more on building theories towards testable hypotheses using case studies, while Yin focuses more on practical concerns of case study research to explore, describe and explain certain findings as Piekkari, Welch and Paavilainen (2008, p. 255) note.

[224] Yin (2009)

[225] Yin (2009)

is further split into three phases as depicted in Figure 13. This gradual research design follows the framework for case research as proposed by Pervan and Maimbo (2005), who in turn build upon the step-by-step process proposed by Eisenhardt (1989).[226]

| Phase 1 | **Case Selection & Purposeful Sampling**
→ 120 cases of mass customization providers with features for social interaction |

| Phase 2 | **Data Gathering & Analysis**
→ common database and focused qualitative comparison (within-/ cross-case analysis) |

| Phase 3 | **Enfolding Literature & Reaching Closure**
→ Identification of *two mechanisms* (Shareability of Design and Interpersonal Presence) as well as *two approaches* (Social Customer Co-Design and Live Customer Co-Design) |

Figure 13: Research design of part IV[227]

Hence *phase 1* comprised the starting point including the identification of an appropriate database as well as the case selection according to strategy of theoretical sampling by Glaser and Stauss (1967).[228] *Phase 1* concluded with the preparation of the instruments for data gathering and analysis as well as the coordination of multiple investigators. In *phase 2*, the empirical field was entered to collect qualitative data on each single case. Further on, the analysis was conducted through constant comparison within as well as across cases. *Phase 2* yielded the identification of a preliminary results concerning mechanisms and dominant approaches of customer co-design. Based on that, *phase 3* began to enfold literature by relating those preliminary results to the theoretical underpinnings introduced in chapter 2. This alignment resulted in the sharpening of the explored constructs, which will be

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[226] See Pervan and Maimbo (2005, p. 1283), table 1 '*Framework for Case Research*' and Eisenhardt (1989, p. 533) with table '*Process of Building Theories from Case Study Research*'.

[227] Own illustration, following Pervan and Maimbo (2005) and Eisenhardt (1989)

[228] Glaser and Strauss (1967)

presented in the findings.[229] Finally, *phase 3* reached closure as marginal improvements became negligible. The following figure depicts the three phases of the research design in a graphical manner. In the following, each of the three stages is explained in greater detail to increase the reliability of the research conducted.

3.2.1   Case Selection & Purposeful Sampling

The first research phase started with the identification of an appropriate database to provide a comprehensive overview of mass customization providers with online interfaces for customer co-design. Several sources were identified, which specifically list mass customization providers for various purposes.[230] The most promising and scientifically created database was *The Customization 500* by the authors Walcher and Piller (2012).[231] The latter study comprises a recent international benchmark study including 500 businesses, which specifically focus on mass customization and personalization in consumer e-commerce. The latter study represents a comprehensive list of mass customization cases, which meet the following criteria:[232]

- the business offers tangible products,
- these products are consumer goods,
- the offer covers a hard customization of product attributes,
- the design process allows configuration to take place completely online,
- the products are sold online, i.e. e-commerce.

On request the authors kindly provided a subsample of this database including names and web links to the respective mass customization businesses. This prior case selection was carried out along the strategy of theoretical sampling as proposed by Glaser and Strauss (1967).[233] The predefined criteria for this sampling mechanism comprised database attributes, which are expected to provide information on social interactivity in online co-design. To name one example, cases which provided features for social interaction, e.g. through community integration or social media links, were selected for the final sample. This first research phase yielded 120 cases

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[229] See chapter 4 in part IV.

[230] Please refer to the following websites for listings of online mass customization companies: www.egoo.de or www.configurator-database.de.

[231] Walcher and Piller (2012)

[232] Walcher and Piller (2012)

[233] Glaser and Strauss (1967)

of customer co-design within the online mass customization context for the subsequent phase of data gathering and analysis.[234]

3.2.2   Data Gathering & Analysis

The phase of *data gathering and analysis* exhibited four major research steps. *Step 1* comprised a screening of the provided case list to ensure validity for the analysis and exhibited a preliminary data collection. Then in *step 2*, each case was examined in depth by multiple assessors and concurrently extensive field notes were collected. In *step 3* the initial case list and the qualitative data were mutually analyzed, compared and merged into one common case database. Finally, in *step 4* a focused qualitative comparison as well as a re-evaluation of the selected cases was performed to finalize the analysis. Each of these research steps is further detailed in the following paragraphs and graphically depicted in figure 14.
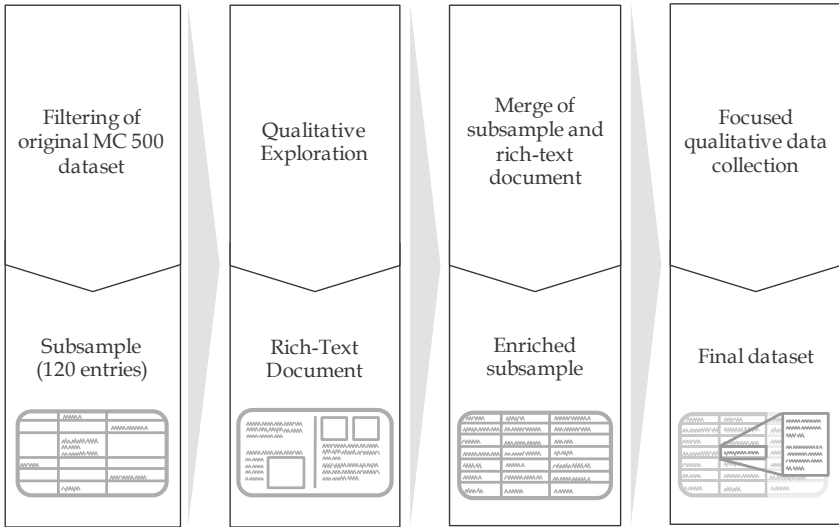
Figure 14: Process of data gathering & analysis in part IV[235]

Research Step 1: In step one, the final selection of candidate cases as provided by the authors of *The customization 500* study were screened to ensure validity for the

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[234] See Annex C for a full list of selected mass customization cases, including name, website, product area and product category according to the study 'The customization 500' by Walcher and Piller (2012).

[235] Own illustration

present analysis. This screening procedure followed the logic proposed by Yin (2009).[236] Further on in this research step, limited information was collected about each co-design process, which is quickly observable when entering the respective website, without getting in-depth. This information concerned availability of media for customer support such as a telephone number, a FAQ section or a website-embedded contact form. Furthermore, information on the availability of links to business-specific profiles on the social networks such as Facebook, Twitter or Google+ was collected. As a result, 115 cases were identified as valid and the respective data were collected systematically in an Excel table. Further on, instruments for subsequent steps of data collection and analysis were prepared and multiple investigators were trained and coordinated for entering the field.

Research Step 2: Within step 2, each case was intensively investigated and an opportunistic data collection in the form of qualitative field notes and screenshots was performed.[237] Opportunistic data collection

> "*allows investigators to take advantage of emergent themes and unique case features.*"[238]

In each case, multiple assessors engaged in the co-design process and evaluated all available support features to design the respective product. This included screening and intensive testing of each singular co-design interface. If the interface allowed several users to design one product in an interactive manner, investigators contacted each other to test this feature and provide a qualitative evaluation. These steps were repeated by three investigators to ensure reliability through multiple assessments. Finally, this step led to a broad collection of qualitative data in the form of field notes and screenshots, which in the first instance were saved for each case in a comparably unstructured manner within a Word document.

Research Step 3: Within step 3, data sources, the initial case list in the Excel table and the qualitative data in the Word document from step 2, were all analyzed, compared and finally merged into one common case database. As far as possible, qualitative information were separated and thus structured into columns for further analysis. Already within this step, the process of analysis was initiated through constant comparison within case and across cases. Within this step, several cases were marked for re-evaluation as the interface for customer co-design through its possibilities for social interaction, i.e. through specific sharing tools for customer-to-

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[236] Yin (2009, p. 91)

[237] Eisenhardt (1989)

[238] Eisenhardt (1989, p. 533)

customer interaction or specific real-time support services stuck. Based on this initial comparison of cases, this research step yielded the preliminary generation of different co-design approaches and distinguishing mechanisms, which make it possible to systematically differentiate the cases.

Research Step 4: Finally, in step 4, a focused qualitative examination of the prior selected cases was performed to strengthen within-case as well as cross-case analysis. Figure 15 depicts the qualitative data collected in the course of data gathering for the 'Shoes of Prey' case; this is a business which entirely focuses on online shoe design. Through the method of constant comparison, an iterative pattern searching has been performed, which yielded into the confirmation of the identified mechanisms and approaches of interactive media to support customer co-design in the online mass customization context. These findings were discussed by the team of researchers and shaped by an overall consensus. Having finalized the step of data gathering and analysis, phase 3 began to relate those findings to existing literature.

Company	Interaction possible	Characteristics of interaction
[...]	[...]	[...]
shirtinator.com	1	[...] save design, download design, share to Facebook, Twitter, send via email [...]
shirtmagic.com	0	/
shoesofprey.com	1	[...] on Facebook and Twitter [...]
smartfurniture.com	0	/
[...]		

Qualitative data for this entry:
- customer to customer (c2c) interaction is possible via Facebook, Twitter and Pinterest; sharing a design creates a shortened URL which can be posted via a 2-click-process on Facebook and Twitter; sharing on Pinterest is only 1 click away
- shared URL directs the user to a catalogue-like site which offers the option to edit the product
- designers of more prominent product designs are mentioned but there is no possibility to contact them

Figure 15: Impression of case study data for final analysis[239]

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[239] Own illustration

3.2.3   *Enfolding Literature & Reaching Closure*

The third and last phase within the given research design focuses on enfolding the relevant literature and finally on reaching closure for the study. Based upon the prior analysis in phase two, the preliminary insights with respect to the concepts of positive reinforcement and media richness were compared and related to the literature presented in the theoretical underpinning (*see chapter* 2). The final result yielded a two-dimensional matrix. The latter step further sharpens the conceptual idea and directly relates to an existing theoretical understanding.[240] Furthermore, it strengthens generalizability of findings and creates an appropriate anchor point for further investigations to expand, contradict or verify those findings.[241] This last phase in the entire research design ended as no more new information emerged from these final considerations. Hence closure was reached and findings were synthesized (*see chapter* 4). Before presenting those findings, the following section characterizes the entire case sample.

3.3   Sample Characterization

This section characterizes and describes the sample of mass customization cases applied to investigate customer co-design in the online context. The cases may be characterized along the product category as indicated in table 5.

Table 5: Overview of sample from online co-design cases[242]

Product Category	Exemplary Products	Number of Cases
Food & Nutrition	Chocolate, cereals, tea, coffee	27
Jewelry & Bags & Accessories	Rings, belts, watchs, bags	19
Miscellaneous	Toys, card games	17
Household & Furniture	Doormats, mattresses, tables	12
Fashion	T-shirts, swim caps	10
Media	Books, calendars	9
Made to Measure Apparel	Suits, shirts	9
Footwear	Shoes, boots	6
Sports	Sleeping bags, golf balls	3
Look	Skins	2
Computer & Electronics	Flash drives	1
Total number of cases		**115**

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[240] Pervan and Maimbo (2005)

[241] Eisenhardt (1989)

[242] Product category and exemplary products adapted from Walcher and Piller (2012)

To provide a better impression of the investigated sample, four cases from various product categories have been selected for a more detailed description in this section. Figure 17 shows those four cases by depicting one screenshot of the customer entry point into the online co-design process. These cases are (a) Sonntagmorgen, (b) Caseable, (c) Massivkonzept and (d) Mel Boteri with their respective web links.
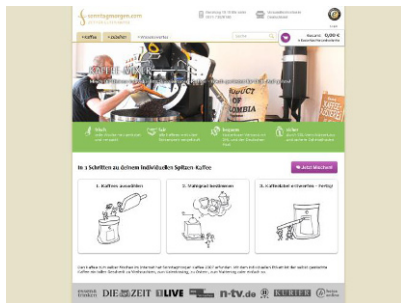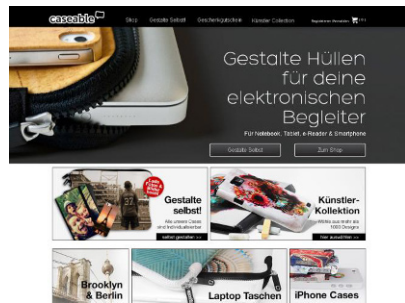
(a) sonntagmorgen.com   (b) caseable.de
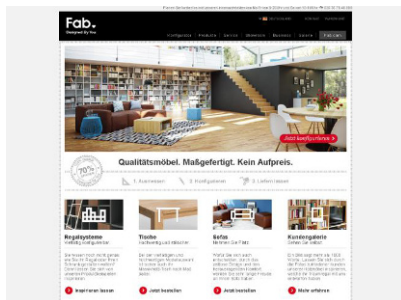
(c) massivkonzept.de / fab.com   (d) melboteri.com
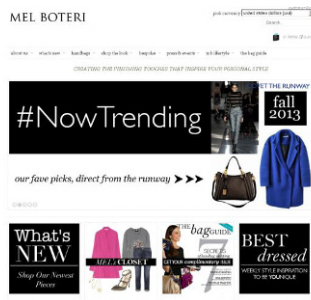
Figure 16: Selected customer co-design cases from online mass customizers

Belonging to the product category food & nutrition, the case of Sonntagmorgen represents the largest group of businesses in the sample. Sonntagmorgen has operated its online business since 2007 and allows customers to mix their desired coffee, adapt the fineness of the grinding and choose a custom label in a three-step process. Other mass customizers in the same product category mainly focus on the customization of chocolate, tea or cereals.

Caseable belongs to the second largest group in terms of product category, i.e. jewelry, bags and accessories. The provider has operated from New York since 2010

and from Berlin since 2011, specializing in customized cases for technical devices such as smartphones, tablets or e-book readers. Customers may enter the online design interface to choose their own device and select visual adaptations for the appropriate case from the broad range of in-house designs and artist collections. Additionally, customers may decide to upload their own images and enter a personalized text to cover their case.

Mel Boteri belongs to the same group of product category as the afore mentioned customizer Caseable, i.e. jewelry, bags and accessories. It has run its business since 2009 and mainly focuses on customized handbags for women. However, the management has continuously expanded the product range to include further luxury accessories for both men and women. Customers may contact a designer from Mel Boteri to create their individual handbag design. It is possible to choose from a range of 40 handbag silhouettes, various leathers and different hardware attachments to design a unique piece. Further cases in the product category of Mel Boteri and Caseable may consider watches, rings or belts for online customization.

Massivkonzept represents the fourth largest group of cases in terms of the product category, i.e. household and furniture. The business offers a sophisticated online toolkit for customers to design their unique piece of furniture, such as shelving systems for a library or tables for dining. Customers may choose from different colors, materials and sizes. Massivkonzept promises to deliver high-quality products produced with craftsmanship. Other cases in this product category focus on products such as mattresses or doormats.

Further product categories consider cases for the customization of fashion products such as t-shirts or swim caps, printed media such as books or calendars, made-to-measure apparel such as suits or shorts, footwear such as shoes or boots, sports products such as sleeping bags or golf balls, skins for various devices and finally computer electronics such as flash drives. All in all, the sample adds up to a total number of 115 cases.

The initial screening of all cases with support channels and media provided in the online co-design interfaces yielded the descriptive statistics presented in table 6. In the majority of cases, i.e. 85%, online mass customizers offer their customers the option to contact them by phone. After that, most businesses rely on a separate FAQ page, i.e. frequently asked questions, to support their customers in the design process. The third most popular option is the social network Facebook. Besides that – not surprisingly – providers offer their customers contact details for e-mail inquiries as well as website-embedded contact forms. A further social network link

is found in 56% of all cases to Twitter, a micro-blogging service, followed by the option to subscribe to a newsletter. A corporate blog is provided in 46% of all cases, and fax numbers are provided by 40% of all customizers. In some cases, support was offered by via live chat embedded in the website and even fewer providers supplied links to support information on YouTube or Google+. Besides that, a broad range of additional media was found, but they applied to less than 10% of the cases in the sample and are thus not considered for a separate listing in the overview in table 6.

Table 6: Descriptive statistics for sample concerning support channels & media

Support via	% of cases	Description
Phone	85%	Fixed-line network
FAQ page	78%	Frequently asked questions
Facebook	78%	Open social network
E-Mail	75%	Electronic mail
Contact form	72%	Website-embedded form
Twitter	56%	Social media; micro-blogging
Newsletter	54%	Newsletter service via e-mail
Blog	46%	Corporate blog
Fax	40%	Document delivery via fixed-line
Live chat	15%	Website-embedded real-time chat
YouTube	14%	Social video network
Google+	12%	Social network

further media with less than 10 % appearance in the sample (sorted by frequency):

Flickr, News, RSS Feed, Pinterest, Community, TV advertisement, Shop, Xing, Digg, Forum,Skype, exhibition/demonstration, Formspring, MySpace, Stumpleupon, Mister Wong, delicious,Google, Yahoo, surveys, Design Challenges, Studivz, LinkedIn, Tumblr, Vimeo, Reddit,Tags

4   Findings

In this chapter, the results from the qualitative cross-case analysis and the iterative comparison are presented. Two primary mechanisms of interactive media are identified which help customers to engage in various forms of social interaction while designing their desired product. These two mechanisms are:

- *Shareability of Design* and
- *Interpersonal Presence*.

Furthermore, the analysis reveals two dominant approaches of interactive media which help customers to engage in social interaction while designing their desired product. These two approaches are:

- *Social Customer Co-Design* and
- *Live Customer Co-Design*.

The following two sections aim to characterize the identified mechanisms and the dominant approaches. To do so, appropriate cases from the analyzed sample are briefly introduced to emphasize the grounding in the qualitative data. Besides that, the explanations refer to the theoretical underpinning introduced in *chapter* 2.

4.1   Mechanisms of Interactive Media

The study of the identified modes of support for collaborative customer co-design presented in the previous chapter shows that online customer co-design can be differentiated along two mechanisms. The first mechanism is *shareability of design* and deals with the perceived ability of customers to easily share a preliminary design and integrate feedback and ideas from other people. The second mechanism, *interpersonal presence,* is adopted from the literature on media theories and looks at how interpersonal feedback from peer users or sales representatives can be provided while designing a product. These two mechanisms make it possible to systematically depict various ways in which c*ollaborative customer co-design* in a two-dimensional matrix can be supported. This systematization derives insights for research and practice.

   In the following subsections, both dimensions are detailed and grounded in literature. The first section focuses on *shareability of design*. Section two deals with *interpersonal presence*.
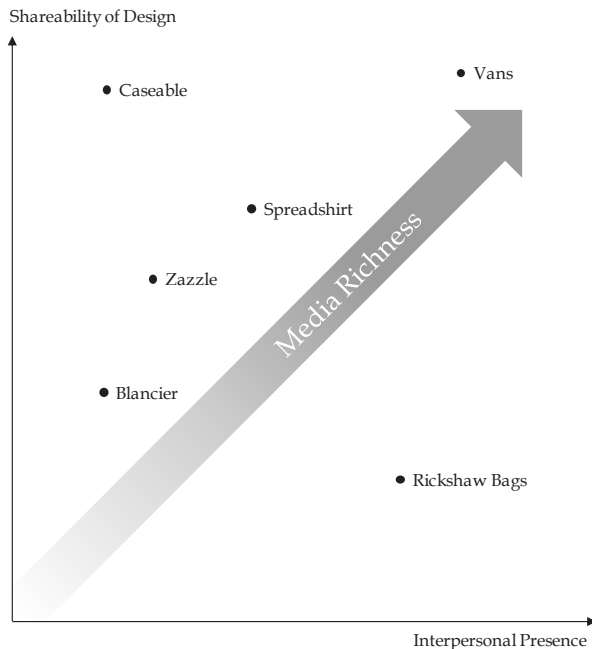
Figure 17: Mechanisms of interactive media to enable customer co-design[243]

4.1.1 *Shareability of Design*

S*hareability of design* refers to the extent to which a certain design status can be shared with other individuals, e.g. friends, design professionals or sales representatives. The notion of *design* thereby considers all the information that is necessary to re-configure the current product as it is created by the customer with the help of the toolkit. This may involve only few adaptations, i.e. one change in the basic color, or even a broader set of adaptations depending on the activities performed by the customer online. The second notion of shareability considers the extent to which this information – in this case the design - is shareable with others.

> "*Information has high shareability if it is easy to share between different individuals without loss of fidelity.*"[244]

As the analysis revealed, the various online co-design interfaces provided different extents for customers to share their current product design, which they had created

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[243] Own illustration

[244] Freyd (2005)

with the help of the online toolkit. In many cases, the *shareability of design* was rather low as users were not provided with any functionalities to easily share their current design status. Therefore, if users want to gather feedback, they are forced to rely on their own know-how for sharing information, e.g. preparing screenshots and adding those to their preferred communication medium, whereas in shared customer co-design, customers are provided with functionalities to share their preliminary designs. These features differed from case to case. Some providers allowed customers to generate a unique link or static image visualization, which could be uploaded onto a social network or embedded into an e-mail. New customers may gather verbal feedback through comments on the same media. Based on that, customers were able to incorporate those ideas and suggestions into their own preliminary designs. However, in a few cases, customers are provided with the ability to share certain designs statuses in a way that enabled recipients to make their own adaptations and send them back. This kind of toolkit features exhibit a higher level of design shareability, as customers are able to build upon each other's designs by incorporating their own ideas. Finally, the few cases with live chat support allow customers to share their current design in real time with sales representatives. This real-time sharing exhibited various options to carry out mutual design activities. These options involved screen-sharing or co-browsing. Screen-sharing considers is the ability to share the sales representative's current screen with the customer. Co-browsing is a more elaborate form, as both parties, i.e. customers and representatives, synchronously browse the interface with their own browser and each activity is instantly visible to both users. Screen-sharing and co-browsing represent the highest level of design shareability, as changes are instantly visible and can be reprocessed by the communication partners.

4.1.2   *Interpersonal Presence*

Analysis of the cases revealed that the provided customer co-design processes significantly differed in terms of *interpersonal presence*. When customers decide to seek feedback on their current product design, they may either receive feedback via direct changes in the design toolkit itself, thereby referring to the previously introduced dimension of *shareability of design*, or they may receive feedback through comments on the user's design proposal. In the online environment, this feedback may take the form of simplified textual comments, emoticons, likes, tweets or interpersonal conversations via voice or even video calls. Through this kind of feedback, customers may receive specific ideas or advice for potential design

adaptations, which may be expected to reduce for example perceived uncertainty and encourage the customer to proceed in the co-design process.

As the previous numeration of the various online communication formats indicates, this feedback on the design proposal may vary, for example in terms of delivery speed, extent or quality depending on the options and restrictions of the applied communication channel and medium. A theory which directly relates to these varying formats of feedback in terms of the medium is *media richness*, which was introduced in the theoretical underpinnings. Media richness considers four dimensions as relevant to classifying feedback into *poor* and *rich*, i.e. in terms of immediacy, number of cues, personalization and language variety. As the identified clusters demonstrate, feedback richness significantly varies in the different customer co-design processes.

In the cluster of *shared customer co-design,* the cases of Caseable.com and Vans.com exemplary demonstrate the difference in terms of immediacy. Vans.com offers an online interface for customers to design their own Vans shoes. Within the design process, the customer may chat with friends while designing a custom shoe. By contrast, Caseable allows customers to design their own case and share the current design on a social network such as Facebook.

4.2   Dominant Approaches of Interactive Media

It can be stated that the two identified clusters belong to the generic concept of *collaborative customer co-design* as introduced by Piller et al (2005).[245] They refer this concept

> *"…to the use of toolkits for customer co-design which are used interactively between different actors."*[246]

The authors position their concept as a means to overcome potential burdens such as *mass confusion* in customer co-design. They argue that the purely technical interaction between the customer and the online toolkit poses several challenges to users and as such may increase perceived risk, which finally leads to the design process being abandoned. Hence having the ability to receive socially derived feedback on the preliminary design status may decrease perceived risk and encourage customers to proceed. In the same vein, Franke et al. (2008) challenge the

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[245] Piller et al. (2005)

[246] Piller et al. (2005)

idea of the traditional dyadic interaction between the toolkit and the user.[247] They argue that mass customizers should decrease the transactional costs for customers to obtain social feedback while designing. This idea refers to a mechanism known from the *offline* environment, where customers may easily receive feedback through face-to-face contact with professional designers. However, as the analysis reveals, this mechanism is not frequently supported in the majority of analyzed cases. Therefore, obtaining valuable feedback in the online environment is still comparably difficult.[248]

In the majority of all cases, customers are not directly supported to collaborate with other actors on their own designs. Customers may visit the webpage of the mass customization provider and use the online toolkit to design a product by themselves. For this process, Frank et al. (2008) introduced the term *customer self-design*. [249] The notion of self-design refers to the idea of self-service. The website is designed in a way which fosters dyadic interaction between the user and the toolkit. Typically, the providers offer contact information with e-mail addresses or a website-embedded contact form, a telephone number and FAQ sections for self-guided information. This information may cover the process of designing as well as characteristics of the product, or information about delivery and payment. Therefore, no online media or other methods are provided to support customers in gathering interpersonal feedback while designing a product online. If customers wish to receive individual feedback, they need to switch media, e.g. contact sales representative via phone. Phone support is provided in the majority of the cases. On the other hand, users could gather individual feedback by producing screenshots and sending them via e-mail, uploading them to a forum or posting them on a social network. However, these steps need to be performed by the user and are not provided by the website for easy and intuitive use. One example for this type is the Swiss company www.121time.com, which offers customization of watches. It needs to be mentioned that many businesses are present on social networks such as Facebook, Twitter or Pinterest; however, the design toolkits do not offer the possibility to share a preliminary design status on one of these networks. Companies tend to link their profiles to the social networks but do not show any deeper integration into the provided toolkits. However, beside these interfaces for

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[247] Franke et al. (2008)

[248] Of course, customers can still ask their friends to take a look on the computer/tablet or they may take a screenshot of the preliminary design status to be sent via e-mail.

[249] Franke et al. (2008)

customer self-design, the analysis revealed two clusters of cases which demonstrate various forms of *collaborative customer co-design*. Both clusters are introduced and characterized in the following subsections.

4.2.1   Social Customer Co-Design

Social customer co-design gives customers the opportunity to *share* their preliminary design with friends, peers or within their personal online community to ask for individual feedback. Hence the activity of sharing can involve individuals, e.g. via direct e-mail, or groups of users, e.g. via social networks. However, the act of sharing varies from case to case. Little initial support for collaboration can be identified in co-design processes where customers are able to save and share the current status of a design in progress. This support may start with the generation of a preliminary design, which describes or visualizes the desired product, e.g. in the form of a 3D-image. This 3D-image may then be shared via e-mail, on a forum, in a market place or on a social network. Friends or peers may comment on that proposal and give their textual or verbal feedback for potential design adaptations. The originator may receive this feedback and continue designing his or her product. This form of collaboration is characterized by two dimensions. First, the design is shared in such a way that it cannot be directly changed or reprocessed using the original toolkit. Secondly, it is an asynchronous mode of exchange, as the immediacy of feedback by peer users is rather low. This scant initial support for customer collaboration can be observed in the co-design process at www.casemate.com, a customizer for individual mobile phone cases.

Table 7: List of cases with support for social customer co-design

▪ Bivolino.com	▪ Designskins.com	▪ Modifywatches.com
▪ Blancier.com	▪ Elementalthreads.com	▪ Munichmyway.com
▪ Carpetcenter.de	▪ Elementbars.com	▪ Optimalprint.de
▪ Caseable.com	▪ Fun-shirt24.com	▪ Shirtinator.de
▪ Case-Mate.com	▪ Gemkitty.com	▪ Shirtmagic.com
▪ Cocomyles.com	▪ Idbeer.de	▪ Shoesofprey.com
▪ Create-a-matress.com	▪ Inditailored.com	▪ Spreadshirt.de
▪ Customizedgirl.com	▪ Laudnividni.com	▪ Xoddo.com
▪ Damao.de	▪ Melboteri.com	▪ Youtailor.de
▪ DeinRegal.de	▪ Milkandhoneyshoes.com	▪ Zazzle.com

A more interactive form of support can be reported in the case of Spreadshirt, a German provider for individualized apparel. In the co-design process of this provider, customers are able to save and share their current design status as

described previously. However, the evident difference is that the shared design may be re-entered into the toolkit and changed by others. Hence, customer collaboration can be carried out in a reciprocal manner of design and re-design, meaning that every user may apply the toolkit for further adaptations. In terms of immediacy of feedback, the present mode exhibits the same characteristic as the previous mode, i.e. it is rather asynchronous.

Another form of social co-designing can be reported for the company Vans, a shoe individualizer (www.vans.com). In this case, the provider supports social co-designing to a high degree, as the toolkit allows multiple users to mutually design shoes almost at the same time. If a user changes one element of the shoe design, he or she may push it to the other user in real time via a separate text chat integrated within the toolkit. The peer user may accept this design and start changing it, based on their own designs and so forth. In addition, the text-based chat also allows users to exchange ideas, comments or textual feedback of any kind. This case exhibits the most elaborate form of *shared customer co-design* in the sample. It is characterized not only by the fact that designs may be exchanged instantly and reprocessed with the help of the toolkit, but also by the highly synchronous nature of the interaction between customers, who may communicate remotely using their personal devices.

4.2.2   *Live Customer Co-Design*

In contrast to the previously introduced cluster, *live customer co-design* exhibits the following two main characteristics. First, it involves collaboration between the customer and a design professional who represents the mass customization provider. Second, the interaction between those two actors is carried out in *real time*, i.e. *live*, which means that the customer and designer instantly respond to each other's input. Within communication science, this form of interaction is frequently described as synchronous exchange (a telephone call, for example), in contrast to asynchronous communication, which is typically the case of e-mail communication.

The cluster of live customer co-design is represented through the key case of www.rickshawbags.com, a company which allows users to design their own bags, e.g. for electronic devices like the iPad. Rickshawbags offers live chat on its website through which online users may obtain instant feedback from sales representatives while they are on the website. This live chat service is integrated on top of the online toolkit and may be obtained from any webpage within the whole web presence of Rickshawbags. The text chat is only available within the opening hours of the company, so can only be obtained within the usual working hours of customer

service. Any user can decide on his or her own, if and when they would like to receive personal support. The chat is a text-based interface which provides real-time interaction with a sales representative or design expert.

Table 8: List of cases with support for live customer co-design

- Create-a-matress.com (Live chat)
- Customizedgirl.com (Chat)
- Golfballs.com (Live help: Video/Chat)
- Milkandhoneywshoes.com (Chat with a stylist!)
- Mytwinn.com (Need help? Chat live)
- Piksieben.de (Support chat)
- Richshwabags.com (Live chat)
- Scurdy.com (Live support)
- Shirtinator.de (Live support)
- Smartfurniture.com (Live chat)
- Snaptotes.com (Live chat)
- Youbars.com (Live help)
- Yousurprise.de (Chat)

Moreover, the live chat interface allows customers to synchronously share the current design status of their product with the representative of the company in real time. This feature enables the communication partners to instantly gain an impression about the current design status and share potential questions and answers. With this option, interpersonal feedback can fully focus on the design and there is no need to align the current impression of the design status, as would be the case in a parallel phone call. Shirtinator.de offers "live support" and explicitly offers customers the option to make use of this service when problems in using the online toolkit (the '*creator)*' occur.[250]

Figure 18: Example of live support for customer co-design at www.shirtinator.de[251]

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[250] The live support is provided for German speaking users with the following information: „Probleme mit dem Creator oder andere Fragen? Chatte jetzt mit uns!".

[251] Screenshot retrieved February 5, 2013 from www.shirtinator.de

5   Conclusion and Future Research

"Science never solves a problem without creating ten more."

– George Bernard Shaw

The present study explored social interaction within the context of online customer co-design. On the basis of a large-scale cross-case analysis of 115 online mass customization businesses, two types of online customer co-design have been identified to support social interaction. These are *social customer co-design* and *live customer co-design*.

Research by Piller et al. (2012) indicate that complementing the process of online customer co-design with the ability to gather social feedback on various design variations is expected to yield benefits.[252] Customers may perceive less confusion or more fun, and providers may increase intention to purchase and finally conversion rates. One way to achieve this may be to provide appropriate sharing possibilities. The identified mechanism of s*ocial customer co-design* is a design process in which customers firstly interact with the provided toolkit and create a preliminary design. They then start to share their current design status via email or social networks to gather feedback from peers, friends or professional designers. As the analysis reveals, these sharing mechanisms significantly differ in their extent. Therefore, in some cases it is easier for customers to share their designs without loss of fidelity. More elaborate mechanisms let customers share the preliminary design in such a way that others can easily incorporate their ideas and reprocess the design. This way, customers may iteratively suggest design adaptations in a reciprocal manner, yielding a highly interactive design process.

Another way to support social interaction is the mechanism of live customer co-design. This allows the customer to gather instant feedback using systems such as live chat or live help. Typically, these systems provide on-screen access to sales representatives, who may synchronously share their screen with the customer to assist in the design process.

Having identified those various types of customer co-design, it was possible to systematize customer co-design processes. It was possible to differentiate these

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[252] Piller et al. (2012)

processes along the mechanisms of design shareability and feedback richness. Further research into the types of social customer co-design and live customer co-design is needed to better understand how these types may foster customer acceptance of mass customization and how providers should offer these processes in their co-design systems.

Part V – Empirical Study 3: Customer Co-Design & Live Help

Structured Abstract

Needs/Goals: Online customization programs are attracting increasing attention. Scholars, however, have questioned their benefits, because they require extensive customer participation. Besides, it is argued that only few users convert to customers, due to the lack of human support. This is why a better understanding of the underlying mechanisms in customer co-design is needed to add new insights to this critical process. Thus the goal was to identify the antecedents and consequences of customers' perceived co-design value and to understand the impact of social presence through live help systems.

Theory/Hypothesis: A structural equation model was developed to test causal relationships. The co-design value is differentiated into two components, i.e. hedonism and creative achievement, which are expected to positively impact customers' perceived preference fit and their behavioral intention to purchase the product or to recommend the program. Three characteristics of the customization system, i.e. information, toolkit and service quality are tested as positive antecedents. Social presence is modeled as a continuous moderating effect.

Method/Data: A quasi-experimental field study was performed in combination with an online survey. Over a period of three months, users (n=205) were encouraged to engage in the online customization program. Based on temporal restrictions, users could perceive and request live help from professional designers.

Analysis: A partial least squares analysis was performed. Criteria for model validation reflected the required thresholds and indicated the reliability of the proposed structural equation model. A multi-group PLS analysis was applied to investigate the moderating effect of social presence.

Findings: Toolkit quality and creative achievement value have substantially greater effects on perceived preference fit than hedonic value. No direct impact on behavioral intention could be identified. Social presence through live help significantly fosters users' perceived service quality and would appear to strengthen the effect of perceived co-design value on purchase intention.

Conclusion: Creative achievement plays a major role in online customization and needs more attention. It directly relates to the relevance of the "I designed it myself" effect described by Frank et al. (2010). Greater social presence of professional designers through live help would seem to strengthen this effect. However, further research is needed to confirm this mechanism.

1   Needs and Goals[253]

> *"It takes great salesmanship to convince a customer to buy something from you*
> *that isn't built or isn't finished."*
>
> – Fred Wilson

Recently, scholars have paid increasing attention to the question of how the marketing strategy of customization adds value for the customer, i.e. perceived value.[254] One superior argument in favor of this strategy is the possibility to reach a better fit between the individual preferences of each singular customer and the final product attributes, i.e. preference fit.[255] From an economic standpoint it is further expected that a better preference fit increases customers' willingness to pay a price premium compared to a non-customized, i.e. standardized, product.[256] Based on that argumentation, it seems attractive to enter the appropriate markets and strive for profits, assuming that the cost of production does not increase disproportionally. However, several *"spectacular failures"* like Levi Strauss's "Original Spin" or Mattel's "My Design Barbie" delivered practical refutations.[257] Some scholars attribute those failures to an inappropriate setup of the customization system. As Franke et al. (2009) note

> *"scholars have questioned the merits of customization because it requires*
> *extensive customer participation."[258]*

Within the literature stream on mass customization, this "*extensive customer participation*" is often denoted under the term *customer co-design* to emphasize the customer's role as a co-designer in this process.[259] Apart from the additional value which originates from the product, e.g. though a better preference fit, various studies deliver empirical evidence that the co-design process itself may provide

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[253] A more developed version of part V is currently under submission at the 14th Annual Conference of the European Academy of Management (EURAM) in co-authorship with Dr. Hagen Habicht as Thallmaier and Habicht (2014c).

[254] Piller and Möslein (2002); Merle et al. (2008); Merle et al. (2010); Turner et al. (2012)

[255] Franke et al. (2009)

[256] Piller et al. (2004)

[257] Salvador et al. (2009)

[258] Franke et al. (2009, p. 103)

[259] Piller and Berger (2003)

additional value to the customer.[260] Thus, besides understanding the additional value of the customized product itself, businesses also need to be aware of the value added through the underlying process. It is argued that a better understanding of these two major sources of value will enable businesses to better adjust their customization systems and increase profits.[261]

The possibility to operate the process of co-design through online interaction has attracted significant interest in research and practice. It is generally regarded as a necessary prerequisite for effective interaction between the business and the customer.[262] Toolkits or configurators which allow customers to explore and specify product attributes in a self-design process became a major point of focus in those technically-oriented studies. On the one hand, those toolkits enable businesses to provide a dedicated solution space for all available product variations. On the other hand, toolkits enable customers to carry out the steps of exploration and product specification on their own, anytime and anyplace.

As part III (empirical study 1) reveals, customer co-design through the proliferation of digital media and service channels pose three major challenges. These challenges are: customers' discovery of the product solution space, the possibility to perceive creativity and the necessity to receive reinforcement in the design process. The study further indicates that customers' discovery and reinforcement benefits from direct human contact with friends or design professionals in physical stores. However, in-store customization frequently fails to convey creative achievement. In contrast, online customization tools strengthen customers' creativity through self-guided activities, i.e. direct interaction with and feedback from the design toolkit. To further explore and predict these mechanisms of value creation, the current study focuses on the online mass customization market and therefore asks the following research question.

> RQ1: What are the antecedents and consequences of the co-design value
> perceived by customers when using an online customization system?

Scholars have criticized various aspects of online mass customization systems.[263] One of these criticisms is the lack of human interaction during the online product design process. Part IV (empirical study 2) of the current thesis investigated online customization interfaces for product design on a larger scale and revealed two

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[260] Ihl et al. (2006)

[261] Merle et al. (2010)

[262] Lee and Chang (2011)

[263] Dellaert and Dabholkar (2009)

dominant approaches to enable direct human support while proceeding in the design process. One approach involves the integration of social media, which allows users to seek contact with friends and other peers for feedback on their preliminary designs. Another approach is to provide direct and real-time consultation from professionals through live help. The main characteristic of live help is that a customer may contact a human assistant direct while on the company's website. Aberg (2002) is among the first researchers who investigated *live help systems* in greater detail. He defines them as follows:

> "*A live help system is an intelligent help system which integrates human experts in the process of advice giving by allowing users to communicate with dedicated expert assistants through the help system.*"[264]

With this understanding in mind, live help systems can have two effects. On the one hand, users may adopt live help during the customization process to request direct help. On the other hand, live help may increase the perception of social presence even if it is not requested by the customer. Businesses need to understand these effects and their impact on the online customization process. Thus it is asked:

> *RQ2: How does live help and an increased social presence impact the value perceived by customers' when using online customization systems?*

Both questions will be addressed in this empirical study, which proceeds as follows. Chapter 2 introduces the theoretical underpinning, elaborates on the causal relationships and derives a set of research hypotheses, which are finally depicted in a structural equation model. Subsequently, chapter 3 details method and data, including the research approach, the setup as a quasi-experimental field study as well as the data collection procedure and the characteristics of the final sample. Chapter 4 details the analysis using the method of partial-least squares (PLS) and explains the realization of the multi-group comparison. Chapter 5 depicts the findings on the basis of the statistical results and refers to existing research in this field. The final chapter 6 summarizes the findings, derives relevant implications and discusses limitations to identify starting points for future research.

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[264]Aberg (2002)

2 Theoretical Underpinning and Research Hypotheses

"The customer's perception is your reality."

– Kate Zabriskie

To answer the proposed research questions, the present study builds upon knowledge in the domains of mass customization, information systems and social presence. On this basis, relevant concepts are identified and introduced stepwise. Subsequently, causal relationships are derived and formulated as hypotheses. Finally, the causal relationships and proposed hypotheses are aggregated into a structural equation model for subsequent statistical analysis.

First, relevant success factors, i.e. preference fit and behavioral intention, are identified and related to form for the major dependent variables in the structural model. Second, the components of customers' perceived co-design value are introduced. Potential consequences are formulated and relevant interrelations with the dependent variables are derived. Third, three distinct quality characteristics of the customization system are detailed and incorporated into the model as potential antecedents. Fourth, social presence is added as a continuous moderating effect into the model. Finally, the proposed relationships and hypotheses are depicted in the structural equation model.

2.1 Preference Fit and Behavioral Intention

The major argument in favor of customization is that customers may receive a product or service which fits their personal preferences better than a pre-configured, i.e. standardized product.[265] As Franke et al. (2010) note

> *"...research into the reasons why products self-designed with MC toolkits may deliver value to customers and command a price premium has clearly emphasized the increased preference fit of the resulting product, that is, the customer's assessment of the extent to which the product's features correspond to her preference system"*[266]

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[265] Dellaert and Stremersch (2005); Franke and Piller (2004)

[266] Franke, Schreier and Kaiser (2010, p. 126)

An essential variable into measuring customers' perceived value of the process of customization is *perceived preference fit*.[267] To capture this value component the measurement scale proposed by Franke et al. (2008) is applied.[268]

Moreover, it is important to understand how customers' behavior in terms of purchase or loyalty is affected. Customer intention is a frequently applied proxy for measuring behavior in survey studies. Studies typically capture this information with the *purchase intention* measure.[269] However, users may also decide to recommend the customization program to others even if they do not intend to purchase a product for themselves. Thus the *behavioral intention* variable is formulated, which captures both customers' *purchase* and *recommendation intention* in one common construct.[270] The appropriate scales are adapted the literature.

In a typical online customization process customers receive instant visualizations when they adapt and modify their preferred design. The more satisfied customers are with the fit of the product to their personal preferences, the more the behavioral intention to purchase the product or to recommend the customization program increases. Thus the first hypothesis is developed as follows.

> *H1: Perceived preference fit has a positive effect on behavioral intention.*

2.2   Customers' Perceived Co-Design Value

From a customer's perceived value perspective, the customization process may exhibit two components. As Merle et al. (2010) note, one component is *hedonic value*, which

> "*denotes the joy and entertainment derived from the [co-design] experience.*"[271]

The other component may be the *creative achievement value*, which relates to the pride-of-authorship effect identified by Schreier (2006).[272] On an aggregated level both components form the experiential customization value, i.e. co-design value.[273]

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[267] Franke et al. (2010)

[268] Franke et al. (2008, p. 559)

[269] Franke et al. (2008, p. 559); Lee and Lin (2005)

[270] Recommendation intention is adapted from the Net Promoter Score by Reichheld (2003). This metric is frequently applied as a valuable indicator of success for online businesses. For more information refer to Keiningham, Cooil, Adreassen and Aksoy (2007).

[271] Merle et al. (2010, p. 505)

[272] Merle et al. (2010, p. 505); Schreier (2006)

[273] Merle et al. (2008)

Various studies, such as the one by Merle et al. (2008), verified the direct impact of the co-design value on the product value.[274] This means that customers attribute parts of the experience from the customization process to the value of the custom product, which in turn is captured through the *perceived preference fit* variable. However, it is unclear to what extent the singular components, i.e. hedonism and creative achievement, impact the preference fit in an online customization system. Thus to explore the relationships between these single components and the product value on a more granular level, the following hypothesis is proposed.

> *H2: (a) Hedonic value and (b) creative achievement value have a positive effect on perceived preference fit.*

Further, it may be argued that the co-design value itself may have a direct impact on *behavioral intention*. If customers perceive the customization process to be fun and perceive the feeling of being creative, the intention to purchase may be strengthened. However, contradicting results have been found in the literature. Merle et al. (2008) for example do not verify a direct effect of the co-design value on the purchase intention.[275] In contrast, Overby and Lee (2006) identify hedonic value as an important predictor for future intentions of customers.[276] Thus to further explore this effect and add to the current disagreement in research and practice, the following hypothesis is developed.

> *H3: (a) Hedonic value and (b) creative achievement value have a positive effect on behavioral intention.*

Additionally, it may be argued that the components of hedonism and creative achievement are interrelated. If customers receive more freedom and autonomy to realize their own ideas, giving their creativity free rein, they may also perceive more fun.[277] Or as Franke and Piller (2004) note

> *"it is likely that users enjoy the design process […] and the joy of performing an artistic and creative act."* [278]

To explore and verify this relationship, the following hypothesis is formulated:

> *H4: Creative achievement value has a positive effect on hedonic value.*

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[274] Merle et al. (2008)

[275] Merle et al. (2008)

[276] Overby and Lee (2006, p. 1164)

[277] Matzler, Stieger and Füller (2011)

[278] Franke and Piller (2004, p. 413)

2.3   Quality of the Customization System

To investigate antecedents of the value of co-design as perceived by customers, three qualitative characteristics of the customization system are investigated. These characteristics were selected according to the differentiation proposed in the updated DeLone and McLean information system success model (2004).[279] The model has been successfully validated for the context of e-commerce and suggests a differentiation between *information quality*, *system quality* and *service quality*.

Information Quality refers to the content of the websites provided by the businesses. If the websites are easy to understand, provide relevant information and are not perceived to waste the user's time, then they should exhibit a high level of information quality. The appropriate questions to measure information quality are adapted from the eTailQ scale on website design, which was published by Wolfinbarger and Gilly (2003). This measurement scale was developed to capture the quality of e-commerce businesses in terms of navigation, information search and order processing.[280] For the present study it is assumed that a higher information quality has a positive impact on hedonic value as well as on creative achievement value.

Toolkit Quality is defined according to the variable system quality in DeLone and McLean's model. To capture this quality characteristic, the questions which have been applied by Ihl et al. (2006) in a quantitative study on co-design processes in mass customization are adapted to the present context. The toolkit is a core feature of the online customization system. It allows users to select from a range of design options in order to adapt and modify the desired product. Studies in the mass customization industry frequently focus on the toolkit as the predominant element of the system.[281] Consequently it is expected that the toolkit's quality influences how customers perceive creative achievement and hedonism.

Service Quality denotes the third qualitative characteristic under investigation as an antecedent of customers' perceived value. It is supposed to measure the support provided by the customer service personnel of the business. As DeLone and McLean (2004) note

> "*this dimension is more important in an e-commerce environment than ever before, because the users are now customers rather than employees,*

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[279] DeLone and McLean (2004)

[280] Wolfinbarger and Gilly (2003, p. 193)

[281] Walcher and Piller (2012); Franke et al. (2008)

> *and therefore, poor user support will translate into lost customers and lost*
> *sales."*[282]

Again, the appropriate criteria for measuring service quality are adapted from the
eTailQ metric proposed by the authors Wolfinbarger and Gilly (2003). The questions
are adapted from the customer service scale. They are designed to measure the
responsiveness of the business to customer inquiries.[283]

Thus, besides *information quality* and *toolkit quality,* a third antecedent, namely
service quality, is incorporated into the structural model to impact customers'
perceived co-design value in terms of hedonism and creative achievement. The
following hypotheses are therefore derived.

> *H5: (a) Information Quality, (b) Toolkit Quality and (c) Service Quality*
> *have a positive effect on hedonic value.*

> *H6: (a) Information Quality, (b) Toolkit Quality and (c) Service Quality*
> *have a positive effect on creative achievement value.*

Finally, it is argued that service quality has a direct impact on behavioral intention.
Especially in e-commerce settings, studies frequently emphasize the role of service
quality in customers' purchasing decisions. One of these studies was conducted by
Lee and Lin (2005), who argue that online businesses should devote valuable
resources to ensuring service quality in online shopping to increase purchase
intentions. Thus the final hypothesis for the structural model reads as follows.

> *H7:Service quality has a positive effect on behavioral intention.*

2.4   The Moderating Role of Social Presence

Social presence refers to the sense of human warmth provided by the website. Gefen
and Staub (2004) for example validate the positive influence of social presence in the
e-commerce environment and its subsequent impact on customers' intention to
purchase the desired product or service.[284] As Hassanein and Head (2006) argue,
mechanisms to instill social presence include providing rich media such as
communities, boards or chats which foster actual interaction.[285] Live help – as it is
understood within the present context – exhibits such a mechanism. It allows
customers to obtain instant human contact through various modes of chat, i.e. text

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[282] DeLone and McLean (2004, p. 35)

[283] Wolfinbarger and Gilly (2003, p. 193)

[284] Gefen and Straub (2004); Hassanein and Head (2007)

[285] Hassanein and Head (2006)

or audiovisual chat.[286] The main characteristic of live help is that a customer may contact a human assistant while on the company's website. Aberg (2002) is among the first researchers who investigated *live help systems* in greater detail. He defines them as follows.

> "*A live help system is an intelligent help system which integrates human experts in the process of advice giving by allowing users to communicate with dedicated expert assistants through the help system.*"[287]

With this definition in mind it can be stated that live help is a mechanism for increasing social presence. Thus live help is expected to positively impact customers' perception of the online co-design process. Besides the traditional modes of contact, e.g. e-mail or telephone, live help provides an additional opportunity for customers to contact design professionals from the company. Even if these modes of contact can be used to ask the same question, still major differences exist, e.g. in terms of usability, responsiveness and perception. In order to analyze the impact of live help as a mechanism for increasing the social presence perceived by customers, a concept of categorical moderator variable is selected.[288]
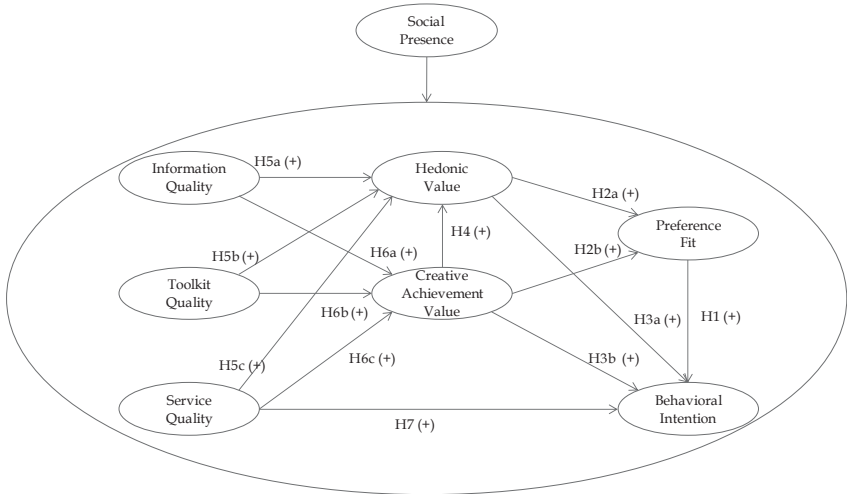
Figure 19: Structural equation model and moderation through social presence[289]

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[286] Aberg and Shahmehri (2002)

[287] Aberg (2002)

[288] Sarstedt, Henseler and Ringle (2011, p. 198)

[289] Own illustration, based upon moderator modeling framework by Sarstedt et al. (2011, p. 199)

Therefore, social presence is modeled as a moderator which is expected to have positive impact on the hypothesized relationships in the entire structural equation model. The final framework for analysis is therefore adapted according to the *"Moderator Modeling Framework"* proposed by Sarstedt et al. (2011).[290]

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[290] Sarstedt et al. (2011, p. 199)

3 Method and Data

> *"The true method of knowledge is experiment."*
>
> – William Blake

The present chapter introduces the method and data used to investigate customers' perceived value in online customer co-design and the impact of social presence via live help. For this reason the chapter is divided into three sections.

First, the study will be enacted within the overall research approach of the present thesis. Second, the specific research method will be detailed, introducing the customization program and the selected live help system. Third, the procedure of data gathering and preparation is described and the final sample is characterized.

3.1 Research Approach

The present study builds upon the findings of parts III and IV. The results of part III imply that customers' perceived value in terms of creative achievement is fostered through self-design toolkits. However, these toolkits are predominantly applied in isolated online communication. The customer interacts with his device and the web presence of the mass customization business and needs to rely on technical feedback mechanisms. Though this kind of interaction is limited in terms of discovery and lacks mechanisms for human feedback. However, those two elements are expected to foster customers' perceived value in a co-design process. Thus *part IV* explored how online media may support mechanisms of human feedback. Online media for human-to-human interaction in customer co-design may be classified along the mechanisms of *shareability of design* and *interpersonal presence*. Rich media allow customers to easily share a preliminary design and to perceive more personal interaction. A dominant approach to support customers in human-to-human interaction has been identified with the integration of social media features as well as live help services. However, it is still unclear how these services are perceived in terms of online customer co-design. Thus this study seeks to identify interdependencies from a customers' perspective in terms of perceived quality and perceived co-design value.

The present study complements the sequential exploratory research design proposed by Creswell (2008) which is detailed in *part II* and depicted graphically in figure 20.[291]
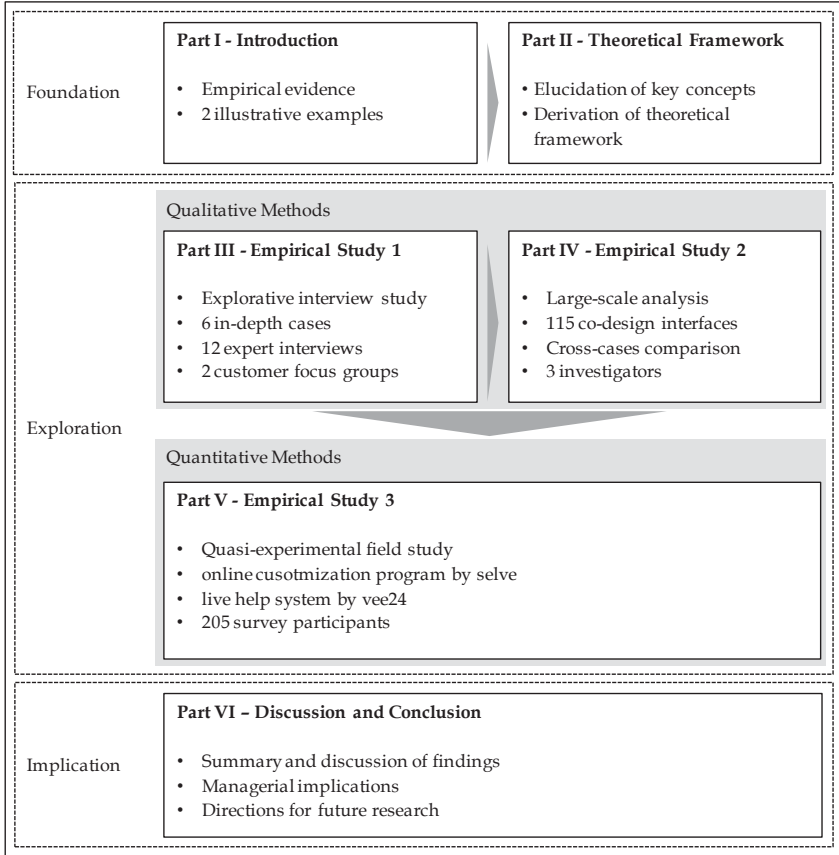
Figure 20: Part V located in the overall research approach[292]

Whereas *part III* and *IV* build upon qualitative research approaches to explore relationships, the present study intends to assess and validate relationships using quantitative data and analysis. Consequently, the analysis uses statistical methods to identify the relevance as well as the significance of hypothesized relationships.

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[291] Creswell (2008)

[292] Own illustration

For this reason the current study focuses on one specific customer co-design process and gathers data from multiple customers who engaged in the same process. This approach contrasts with the one used in the previous studies, which derived the findings from cross-case analysis of customer co-design processes from various mass customization providers. Hence the study at hand picks up the findings from previous investigations to validate them on a larger database within the same customer co-design process. To achieve this, a quasi-experiment is set up in a real-world online co-design process. The major interface for that experiment is provided by the mass customization business selve which focuses on the individualization of luxury shoes. This interface was a fundamental element of the experimental setting. On top of that interface, a live help service by Vee24 was integrated to facilitate live customer co-design as outlined in *part IV*. Figure 21 depicts the empirical research approach within the overall research design. The setup of the quasi-experimental field study will be detailed below.

3.2   Research Method

The chosen research method was a *quasi-experimental field study* as outlined by Cock and Campbell (1979).[293] In contrast to a randomized controlled trial within a laboratory, an experimental study in the field is expected to yield better external validity because of the more naturalistic environment. In their textbook, the authors describe various formats for quasi-experimental field studies.[294] For the present study, the *non-equivalent control groups post-test only* format was chosen. This format comprises two major characteristics, which are appropriate to realizing the experimental trial in the field and concurrently fulfilling the requirements of data gathering and analysis for the proposed research questions.

First, the format establishes two *non-equivalent groups* of users, which receive different treatment, i.e. the experimental group and the control group. In the present study, the users in the experimental group received the opportunity to call for live help from a professional designer. In contrast, the users of the control group did not receive this opportunity. The perceptions are then compared between those two groups. An important way to identify differences due the effect of live help is to assure a randomized assignment of the users to the two groups. Due to various technical and temporal requirements of the customization program and the live

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[293] Cook and Campbell (1979)

[294] Cook and Campbell (1979)

help system, a sufficient mechanism for randomization could not be developed. Instead, the setup partly relied on a self-selection mechanism whereby users decided on their own whether they required the live help service or not. Thus the final groups need to be considered as non-equivalent.

Second, the selected format exhibits a *post-test only* design. This means that users were encouraged to engage in the online customization program and were then asked to participate in an online survey. Hence the point of data elicitation was placed beyond the customization process, i.e. post-test, to ensure that every participant passed the customization program and applied the toolkit to configure his desired pair of shoes. For users in the experimental group, the availability of live help was controlled via temporal settings. Hence at the beginning of the three-month period, no live help was provided, whereas the availability was increased within the second and third month of the experiment. The customization program and the selected live help system are introduced in more detail below.

3.2.1   Online Customization Program by selve

The online customization program offered by selve has been selected for the quasi-experimental field study.[295] From a customer's perspective the shoe customization program by selve needs to be differentiated along several parameters.

First, customers may choose from a large selection of different shoe types and shapes. This includes adaptation of different heel sizes, soles and shapes. Second, customers may choose from a huge variety of different colors and fabrics to adapt the aesthetic design. Finally, the shoes may be adapted in terms of fit, i.e. to the individual size and shape of the customer's feet. This last customization step is a basic element of differentiation from comparable businesses in the market. Selve provides an online configuration tool, which allows customers to select the shoe shape and adapt colors and fabrics. Regarding the fitting, selve offers two solutions. Either the customer decides to visit a physical shop where the fitting is carried out by professional designers, or they choose the online-based process whereby the customer receives sample shoes by postal mail. These sample shoes are as close to the desired shoe design as possible and allow customers to check the fitting on their own. Based on that fitting, the customer provides his feedback to selve and subsequently the order is processed. For the quasi-experimental field study, the

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[295] Refer to part III for a short description on the selve business model.

online-based co-design process at selve served as a basis for evaluating customers' value perception. Furthermore, the live help system below was implemented.

3.2.2   Online Live Help System by Vee24

Live help describes a form of instant human support which is directly available through the website. Thus customers may continue to use the electronic device which they currently use to view the web presence of the business and concurrently may interact with a service representative. As Aberg (2001) states, live help

> "…features a combination of human assistants and computer-based support."[296]

For the present quasi-experimental field study, a live help system was chosen which exhibits rich media for interpersonal interaction with the customer. The rationale behind this requirement was that such a system provides a service level which fits the price level of the corresponding product. Shoes from selve range in price from €300 up to €500 and more, depending on the adaptations required by the customer. After intensive market research, it was decided to select the live help system provided by Vee24.[297] This system exhibits a rich multi-media environment to support interpersonal interaction on the website. The features may be differentiated into two basic categories.

The first category considers the question of how the customer and service representative may share the current content of the website, e.g. a specific shoe configuration. Vee24 offers two modes for that. In the basic mode, Vee24 allows one way screen-sharing from the representative's screen to the customer's screen. Both users may control the screen with their devices and take actions, e.g. browse a different website. Besides that, the representative may switch to the co-browsing mode. The major difference from the customer's perspective is the possibility to synchronize the browsing activities while using their own browser interface. Thus co-browsing lets customers use their own browsers and browser settings while the content of the website is synchronized with the sales representative's desktop.

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[296] Aberg, Shahmehri and Maciuszek (2001)

[297] A separate market study was conducted by Marie Mellissopoulos and Lisa Ecker, both business students at the Technical University of Munich (TUM). First, a set of live help providers available on the market was identified. Second, these live help systems were tested and evaluated from a customer's perspective to generate a list of potentially relevant features. Third, a matrix was prepared to compare providers and their features for subsequent selection. Vee24 turned out to provide a comparably rich and convenient live help system. Upon request, the service provider agreed to participate in the experimental study with the mass customizer selve.

The second category considers the interpersonal interaction between customer and sales representative. The live help system provided by Vee24 allows the service representative to broadcast a live video signal. This video connection is one-way. Therefore, the customer may see the sales representative, but not the other way round. Communication is realized through the microphone of the customer's device. If the audio or video connection cannot be established due to technical issues, e.g. low bandwidth or missing microphone, the customer may use the provided text chat instead. However, a primary element of the live help system is the live video contact with the service representative, who may also use this opportunity to show real shoe samples via video to provide more in-depth information on the product.

3.3   Data Collection and Characteristics

The present section details the development of the online survey and the mechanisms used to motivate user participation. Furthermore, the sample is characterized along important sociodemographic characteristics.

3.3.1   Survey and Motivation

To gather data on customer perception of the customization and the live help system, an online survey was conducted. The online service *SoSci Survey* was selected to perform the pre-test as well as the final study.[298] The development of that survey comprised two major steps.

First, appropriate scales and items from the literature in the relevant research domains as outlined in the theoretical underpinnings were selected. In order to ensure a high survey and data quality, the selected scales, items and questions had to be published in peer-reviewed and ranked journals.[299]

Second, the majority of items had to be translated from English into German. As this translation risked modifying the meaning and measurement intention, two separate pre-tests were conducted. For each pre-test, a separate group of users outside the research team was recruited. After each pre-test, the questions were adapted according to the feedback. This included modifications to increase

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[298] Leiner (2013); See Appendix E for a screenshot of the introductory landing page as well as the "Thank You" page at the end of the survey.

[299] The German ranking VHB-JOURQUAL 2.1. (2011) served as reference. For more details refer to Schrader and Henning-Thurau (2009).

understandability, decrease potential ambiguities and shorten the time exposure. The final set of constructs, items and questions is depicted in tables 10 and 15. [300] The answers were provided on a 7-point Likert scale ranging from "totally disagree" to "totally agree".

Customers were encouraged to engage in a co-design process for a customized pair of shoes on the business website of selve. During the process of co-design, live help was made available for direct consultation to a group of customers based on temporal restrictions. Customers decided on their own whether to call for help or to refuse the service provided. At the end of the co-design process, customers had to save their current design and subsequently were guided to the online survey to answer the proposed questions about their perceptions.

Two incentives were provided to survey participants. For every finished survey, a €15 reduction code was provided at the end for the next purchase at selve. It was specified that the reduction code could only be used once per person. With this condition it should be assured that participants only participate once. Furthermore, every participant was given the option to win an entire shoe design with selve by providing one e-mail address. Two draws selected the winners.

3.3.2   Characterization of Sample

In total, 612 data sets were generated including pre-tests. The two independent pre-tests account for 258 (42%) data sets, which were skipped for the final analysis. During runtime of the quasi-experimental field study, 412 requests for the online survey were recorded including duplicate requests or requests from search engines. Finally 214 users completed the survey. The majority of abandonments were encountered on the introductory page of the survey. Throughout the following pages of the survey, the rate of abandonments decreased radically without any bigger outliers. Thus the survey design can be regarded to be of considerable quality, because the majority of users who proceeded beyond the introductory page finally finished the entire survey.

After completion of the online survey, the generated data were prepared for analysis. This preparation involved the case wise deletion of non-applicable data sets. Three criteria were applied for deletion of non-applicable data sets. First, data sets which included an information on technical survey testing, i.e. via a specific URL parameter, were deleted. Second, data sets which included inconsistent or too

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[300] See Appendix E for the final German version of the survey and its questions.

much missing information were deleted. Third, data sets which exhibited an indication for comparably fast completion of the survey were deleted. It is assumed that to answer the questions seriously, a certain time span is necessary. Finally, after deletion of the non-applicable data sets, 205 fully answered surveys remained.

Table 9: Characterization of entire user sample for quantitative analysis

Characteristics	% of respondents (n = 205)
Gender	
female	91.5%
male	8.5%
Age	
<15	0.5%
15-19	5.6%
20-24	8.5%
25-29	15.0%
30-34	15.5%
35-39	9.9%
40-44	17.4%
45-49	15.5%
50-54	4.7%
55-59	3.8%
60-64	2.3%
>65	1.4%
Education	
secondary school education	14.6%
completed apprenticeship	7.0%
technical diploma	9.4%
university-entrance diploma	18.3%
non-university degree	44.1%
another degree	3.8%
(as yet) no degree	2.8%
Occupation	
pupil	5.2%
in training	2.8%
student	7.5%
employee	48.8%
freelancer	20.2%
unemployed/seeking work	2.3%
other	13.1%

In terms of sociodemographic information, the respondents were 91.5% female and 8.5% male. This ratio roughly corresponds to the characteristics of the current customer statistics as reported by the company representatives of selve. Regarding age, it turns out that 81.8% of respondents fall in the range between 20 and 49. In terms of education, the majority of respondents hold a diploma or university degree, i.e. 71.8%. Besides that, most respondents indicate that they are students, employed or working freelance, i.e. 76.5%. Nevertheless, the characteristics of age, education and employment indicate a solid distribution across the provided categories. In contrast to experiments which solely base their analysis on student samples, the current study seems to increase external validity.

4   Analysis

"Quality in a service or product is not what you put into it.
It is what the client or customer gets out of it."

– Peter F. Drucker

Within the present field of research, two statistical methods of analysis, i.e. variance-based and co-variance based, are typically applied for structural equation modeling.[301] For the present research approach, it was decided to apply the variance-based method of partial least squares (PLS), also referred to as soft modeling by Wold (1982).[302] Two reasons led to this choice.

First, the proposed hypotheses and their composition in the structural equation model are rather new and have not been subject to quantitative investigations. Thus, the research approach exhibits a rather predictive character to identify relevant causal relationships, which have yet not be identified. This is necessary, as theory and knowledge about the investigated relationships are still limited.[303]

Second, the conditions in terms of sample size and normal distribution for the co-variance based method have not been met properly.[304] However, the PLS method allows for smaller sample sizes and does not require normal distribution for the parameters. Consequently the PLS method was chosen to perform the analysis of the collected data for the structural equation model.

In the following, the analysis is detailed in two major steps. First, the model validation is detailed. Second, the multi-group analysis is explained. To perform the PLS analysis the software tool SmartPLS developed by Ringle et al. (2005) was applied.[305]

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[301]Weiber and Mühlhaus (2010, p. 66)

[302] Wold (1982)

[303] Verhagen and van Dolen (2009)

[304] Urbach and Ahlemann (2010, p. 13)

[305] Ringle, Wende and Will (2005)

4.1   Model Validation

The validation of the measurement model is a prerequisite for evaluating whether or not the proposed hypotheses are supported by the empirical data. This validation step precedes the assessment of the structural model. The PLS method does not provide any generally accepted goodness-of-fit criterion.[306] Instead it provides a set of criteria for measuring the reliability and validity of singular elements within the measurement model. These criteria need to be assessed step-by-step to validate the applicability of the results. As Urbach and Ahlemann (2010) note, for using PLS and SEM in information systems research, a

> "*certain model validation process has been found reasonable*".[307]

This process has two major steps as follows.

First, the validation of the singular measurement models are carried out. Second, the validation of the structural model is performed. For the assessment of the measurement models a distinction needs to be made between reflective and formative models. The present analysis uses a reflective measurement model where the latent variables are expected to form the indicators.[308] Hence the direction of causality for all applied variables is directed from construct (variable) to item (indicator).[309] In contrast to formative models, this means that all reflective indicators are operationalized in such a way that they are expected to correlate positively. One good example in the current study is the *creative achievement value* construct. All four items of this construct target an identical phenomenon, i.e. the achievement someone perceives when creating their own product with the toolkit on the website. The appropriate questions measuring the perceived value of creative achievement are interchangeable, should show covariance with each other and are expected to yield the same antecedents and consequences.[310]

For the assessment of the structural equation model the guidelines which are proposed by Straub et al. (2004) and Lewis et al. (2005) are applied.[311] First the *unidimensionality* is assessed by applying an *explorative factor analysis* (EFA). The objective of this assessment is to identify whether the items *load* on the

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[306] Hair, Ringle and Sarstedt (2013)

[307] Urbach and Ahlemann (2010, p. 18)

[308] Chin (1998)

[309] Urbach and Ahlemann (2010, p. 11)

[310] Urbach and Ahlemann (2010, p. 11)

[311] Straub, Boudreau and Gefen (2004); Lewis, Templeton and Byrd (2005)

corresponding construct with a high coefficient or not. A high loading is considered if the coefficient exceeds the threshold of 0.70.[312] Table 11 depicts the standardized factor loadings (FL) from the PLS algorithm for each item within its corresponding construct. For only one item a factor loading of 0.53 needs to be reported, which does not exceed the minimum threshold. Thus this item needs to be dropped for the subsequent analysis of the model. For the remaining majority of items the factor loadings exceed the minimum level and therefore pass the assessment of *unidimensionality*.

Furthermore, the *internal consistency reliability* needs to be considered for the reflective model. Two criteria are traditionally applied for this validity type, i.e. *Cronbach's alpha* or the alternative measure which is referred to as *composite reliability* (CR). With regard to Chin (1998) the criterion of *composite reliability* is expected to overcome the deficiencies of Cronbach's alpha and is thus reported in Table 11 instead.[313] However, regardless of which criterion is applied, if the reported values exhibit the minimum level of 0.7 for predictive research, the internal consistency of the constructs is considered reliable. Put simply, this assessment indicates that all applied items exhibit the same range and meaning within one construct.[314] The reported values exceed the minimum level of 0.7 and thus can be considered reliable in terms of internal consistency. Further, none of the reported values for composite reliability exceed the 0.95 level, which could indicate a potential problem with a common method bias.[315]

Next the *indicator reliability* needs to be assessed. It measures

> *"how much of the indicators [sic] variance is explained by the corresponding latent variable".[316]*

In predictive research designs, various thresholds are proposed which range from 0.3 to 0.5 as a lower level.[317] Lewis et al. (1995) for example recommend 0.45 as a lower value. Within the present research, all reported figures exceed 0.5 except for one item in the *toolkit quality* construct.[318] However, for this item an indicator reliability of 0.49 can be reported which still exceeds the minimum value

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[312] Hair et al. (2013, p. 6)

[313] Chin (1998); Urbach and Ahlemann (2010, p. 18)

[314] Urbach and Ahlemann (2010)

[315] Urbach and Ahlemann (2010, p. 18)

[316] Urbach and Ahlemann (2010, p. 19)

[317] Urbach and Ahlemann (2010, p. 18)

[318] Lewis, Snyder and Rainer, JR. (1995)

recommended by Lewis et al. (1995). All of the reported values are significant, at least at the 95% confidence level, which is calculated using the resampling method of bootstrapping.[319] Thus from the reported values it can be stated that all indicators are reliable.

Next, the *convergent validity* of the reflective measurement model should be assessed. It indicates to which degree

> "*individual items reflecting a construct converge in comparison to items measuring different constructs*".[320]

The appropriate criterion for this assessment is *average variance extracted* (AVE) proposed by Fornell and Larcker (1981).[321] The criterion should exceed the value of 0.5. As can be seen from table 11, the reported AVE exceeds this value for all applied constructs, thus sufficient convergent validity can be identified in all variables.

Finally, to close the first step of the assessment which considers the reflective measurement model, the *discriminant validity* needs to be considered. If it is given for all measured constructs, it can be stated that the items "*do not unintentionally measure something else*", i.e. any other construct.[322] To asses *discriminant validity* the criterion proposed by Fornell and Larcker (1981) is applied.[323] It requires that the square root of the variables' AVE is greater than the highest correlation with any other latent variable in the entire model. To check for this rule, Table 12 provides the square roots of the variables' AVE on the diagonal and the correlations of the variables to each other below the diagonal. Comparing the values on the diagonal with the values in the same column shows that the Fornell and Larcker (1981) criterion is fulfilled. Thus for all variables in the analysis it can be stated that they show more variance with its assigned indicators than with any other variable and this means that discriminant validity is identified.

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[319] Bootstrapping exhibits the method of calculating significances within the PLS algorithm and is provided by software tool SmartPLS. According to Hair, Hult, Ringle and Sarstedt (2014) the following settings have been applied: cases = 205 and samples = 5000.

[320] Urbach and Ahlemann (2010, p. 18)

[321] Fornell and Larcker (1981)

[322] Urbach and Ahlemann (2010, p. 18)

[323] Fornell and Larcker (1981)

Table 10: Standardized factor loadings and multiple assessments of reliability

	FL	IR	CR	AVE
Construct: Website Quality			0.90	0.75
The website provides in-depth information.	0.78	0.61		
The website doesn't waste my time.	0.90	0.81		
It is quick and easy to complete a transaction on this website.	0.91	0.83		
Construct: Toolkit Quality			0.86	0.67
While designing my individualized shoes I perceived …the number of customization options as just right.	0.88	0.77		
… the number of design options (color, fabric and shape) as sufficient	0.86	0.74		
…the number of shoe size options (length, width) as appropriate	0.70	0.49		
Construct: Service Quality			0.94	0.84
The company is willing and ready to respond to customer needs.	0.89	0.79		
When you have a problem, the website shows sincere interest in solving it.	0.96	0.92		
Inquiries are answered promptly.	0.90	0.81		
Construct: Hedonic Value			0.92	0.80
Being able to customize shoes with selve is interesting.	0.90	0.81		
Being able to customize shoes with selve is entertaining.	0.93	0.86		
Being able to customize shoes with selve is not fun. [dropped item]	0.53	0.28		
Being able to customize shoes with selve will be enjoyable.	0.85	0.72		
Construct: Creative Achievement Value			0.92	0.73
Selve gave me a lot of autonomy in the creation of these shoes, and I really enjoyed it	0.88	0.77		
By personalizing these shoes, I had the impression of creating something.	0.83	0.69		
I could give my creativity free rein while designing these shoes, and I really enjoyed it.	0.84	0.71		
I am very proud to have designed these shoes by myself.	0.87	0.76		
Construct: Perceived Preference fit			0.92	0.79
I am very satisfied with my self-designed shoes from selve.	0.91	0.83		
Compared with the shoe-designs available at conventional stores, I prefer my self-designed shoes from selve.	0.87	0.76		
My self-designed shoes from selve reflect my idea of an ideal shoe design.	0.89	0.80		
Construct: Behavioral Intention			0.89	0.80
How likely are you to buy your self-designed shoe from selve?	0.88	0.78		
How likely are you to recommend shoes from selve to others?	0.91	0.83		

FL: standardized factor loading; IR: indicator reliability; CR: composite reliability; AVE: average variance extracted.

Table 11: Discriminant validity using the Fornell-Larcker criterion

	Inform. Quality	Toolkit Quality	Service Quality	Hedonic Value	Creative A. Value	Perceiv. Pref. Fit	Behavio. Intention
Inform. Quality	0.87						
Toolkit Quality	0.44	0.82					
Service Quality	0.62	0.49	0.92				
Hedonic Value	0.58	0.50	0.49	0.89			
Creative A. Value	0.52	0.69	0.57	0.56	0.85		
Perceiv. Pref. Fit	0.52	0.49	0.59	0.56	0.70	0.89	
Behavio. Intention	0.45	0.30	0.53	0.44	0.47	0.59	0.89

on the diagonal the square roots for each of the constructs AVE (average extracted variance) are calculated for comparison

Finally it can be stated that only one item had to be dropped to meet all the required criteria for reliability and validity of the reflective measurement model. This item belongs to the *hedonic value* construct which still exhibits an acceptable number of three items after dropping one, as reported in Table 11. To summarize the assessment of the reflective measurement model, it can be stated that all remaining constructs are viable according to the requirements of the PLS algorithm.

After having successfully validated the reflective measurement model, the structural model needs to be assessed. Again the procedure proposed by Urbach and Ahlemann (2010) as well as by Hair et al. (2013) is applied to fulfill this assessment. Several criteria need to be considered to check the validity of the structural model.[324]

The first criterion is the coefficient of determination R^2 for every endogenous variable in the analysis. R^2 serves as an indicator to determine how much of the total variance can be explained through the exogenous variables. Within the present structural model, R^2 is reported in Table 13 for the constructs hedonic value, creative achievement value, perceived preference fit and behavioral intention.

> "*Chin (1998) proposes values of approx. 0.67 as substantial, values around 0.333 as [sic] average, and values of 0.19 and lower as [sic] weak.*"[325]

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[324] Hair et al. (2013); Urbach and Ahlemann (2010)

[325] Chin (1998); Urbach and Ahlemann (2010, p. 21)

The reported values for R² within the present analysis range from 0.41 (behavioral intention) to 0.54 (perceived preference fit).[326] Thus, according to Chin (1998), all values can be considered at least average.[327] Values are depicted in the following figure which represents the entire structural model and selected results of the final econometric analysis.

Besides the explained variance R² the predictive relevance Q² of each endogenous variable should be assessed using the method of blindfolding.[328] If this value is positive, i.e. exceeds the threshold of 0, it passes the assessment and indicates predictive relevance for a particular construct. Further, a model exhibits more predictive relevance if Q² is higher.[329] The lowest value for Q² is for *behavioral intention* with 0.323 as Table 13 depicts. Thus the minimum requirements are fulfilled for every construct.

Table 12: Results for R² and Q² of structural model

Endogenous constructs	R²	Q²
Hedonic Value	0,443	0,339
Creative Achievement Value	0,562	0,407
Perceived Preference Fit	0,536	0,414
Behavioral Intention	0,407	0,323
R² : explained variance; Q²: predictive relevance		

The second criterion considers the evaluation of the path coefficients. Every path within the model represents a hypothesized effect and therefore refers to one of the hypotheses (*H1 to H7*) presented previously. The path coefficients are assessed in terms of their algebraic sign, their magnitude and finally their significance.[330] The algebraic signs turn out to be positive for every hypothesized effect and thus comply with the expectations. The magnitude of the relationship is reported in terms of the *path coefficient estimate* ß within table 14.

> *"Some authors argue that path coefficients should exceed 0.1 to account for a certain impact within the model."*[331]

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[326] See table 12

[327] Chin (1998)

[328] Hair et al. (2013, p. 7)

[329] Fornell and Cha (1997)

[330] Urbach and Ahlemann (2010, p. 21)

[331] Urbach and Ahlemann (2010, p. 21); Weiber and Mühlhaus (2010, p. 259)

The reported values in Table 14 indicate that ß exceeds this threshold for the majority of hypothesized effects, except for *H3a*, *H3b* and *H5c*. Hence the figures do not show any indication for those hypotheses. Appropriate implications are outlined in the subsequent sections. The information on the significance of the hypothesized effect is given with the t-value in Table 14. Again, the resampling method of bootstrapping provided one t-value for every path. If the t-value exceeds the threshold of 1.96 (2.59), the corresponding path coefficient can be considered as significant on the 95% (99%) confidence level. Hypotheses *H1, H2a, H2b, H4, H5a, H6b, H6c* and *H7* can be considered significant on the 99% confidence level, while hypothesis *H6a* only shows a significance on the 95% level. Hypotheses *H3a, H3b* as well as *H5b* and *H5c* do not show any significance at all.

Table 13: Summary of final results for every hypothesized effect

#	Hypothesized Effect	ß	t	f²	q²
H1	Preference Fit → Behavioral Intention	0.398	4.671**	0.113	0.089
H2a	Hedonic Value → Preference Fit	0.241	4.671**	0.084	0.046
H2b	Creative A. Value → Preference Fit	0.569	9.335**	0.483	0.289
H3a	Hedonic Value → Behavioral Intention	0.098	1.022(ns)	0.010	0.021
H3b	Creative A. Value → Behavioral Intention	0.010	0.114(ns)	0.000	-0.001
H4	Creative A. Value → Hedonic Value	0.234	3.008**	0.043	0.025
H5a	Information Quality → Hedonic Value	0.356	4.988**	0.131	0.082
H5b	Toolkit Quality → Hedonic Value	0.148	1.806(ns)	0.020	0.004
H5c	Service Quality → Hedonic Value	0.063	0.810(ns)	0.004	0.001
H6a	Information Quality → Creative A. Value	0.169	2.309*	0.039	0.021
H6b	Toolkit Quality → Creative A. Value	0.515	9.150**	0.438	0.236
H6c	Service Quality → Creative A. Value	0.208	2.999**	0.053	0.033
H7	Service Quality → Behavioral Intention	0.252	3.479**	0.064	0.043

ß: path coefficient estimates; t: t-value (significance level * for t > 1,96 and p-value < 0,05 and ** for t > 2,59 and p-value < 0,01); f²: effect size; q²: predictive relevance (Stone-Geisser-Criterion)

Further, Table 14 adds information on the effect size f² as well as the predictive relevance q², which is also referred to as the Stone-Geisser criterion (1974).[332] Effect size determines whether or not the exogenous variables have a substantial impact on the endogenous variables. Thresholds between 0.02 and 0.15 indicate small, between 0.15 and 0.35 a medium and above 0.35 a large effect on the model.[333] Thus a large effect can be identified for hypotheses *H2b* and *H6b*. All further hypotheses are considered to exhibit significant path coefficient f² ranges between 0.02 and 0.15

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[332] Stone (1974); Geisser (1975)

[333] Urbach and Ahlemann (2010, p. 21)

and as such indicate a small effect on the endogenous variables. According to Hair et al. (2013) the assessment of the predictive relevance should consider the thresholds of 0.02, 0.15 or 0.35 respectively for a weak, moderate or strong degree of predictive relevance. Again, for hypotheses *H2b* as well as *H6b* a q² a moderate predictive relevance can be identified, as both values exceed the proposed threshold of 0.15.

To summarize this second assessment, it can be stated that *H2b* and *H6* receive remarkably high values in comparison to the remaining hypotheses and therefore receive specific attention in the findings and discussion sections. Besides that, all assessed criteria comply with the proposed thresholds. Consequently the structural model can be considered valid and reliable for further analysis.

4.2   Multi-Group Comparison

As reported, survey respondents were asked whether or not they perceived the live help service, i.e. presence of live help. The assumption, as outlined in the theoretical underpinning, is that the presence of live help influences the way users perceive their online design activities, even if they do not intend to make use of this service. To find out whether a survey respondent perceived live help or not, a simple control question was provided. As presented in the characterization of the data, approximately 22% of respondents answered that they perceived live help. Thus the entire data set may be split into two groups, i.e. one group which did not recognize the additional "selve live help" service and another group which noticed its presence. To answer the research question as to whether the presence of live help impacts the way the online co-design process is perceived a multi-group analysis for PLS was applied (MGA-PLS).

As outlined by Sarstedt et al. (2011), various statistical methods are available to realize this multi-group analysis, which makes it possible to model "*continuous moderating effects*".[334] Thus the major advantage of this approach is that the impact of live help may be assessed for the entire model, including both the measurement and structural model. For every proposed hypothesis *H1* to *H7,* the corresponding relationship between exogenous and endogenous variables may be compared in terms of direction (algebraic sign) and strength. In order to assess if any observed difference between the two groups is statistically significant, a modified version of

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[334] Henseler (2012); Sarstedt et al. (2011)

the t-test for the two independent samples was applied.[335] This parametric approach was initially proposed by Keil et al. (2000) and is referred to as the "*most expedient*" by Chin (2000).[336]

First, this approach requires the standard PLS path modeling algorithm to be run separately for every group to obtain the path coefficients. Second, the bootstrapping algorithm needs to be applied separately for every group to calculate the standard errors for every relationship. The results of those two calculations are depicted in Table 13. Within this table, the group-specific figures of path coefficient and standard error are noted for every hypothesized effect. Group 1 includes the responses from users who did not perceive live help, whereas group 2 includes the 22% of users who perceived selve live help as present. Next, the formula proposed by Chin (2000) is applied to calculate the relevant t-value, which is reported in the last column of table 13.[337]

Table 14: Results of multi-group PLS analysis on the effect of social presence

#	Hypothesized Effect	Path coeffic.		Standard Error		t
		Gr. 1	Gr. 2	Gr. 1	Gr. 2	
H1	Per. Prefere. Fit → Behavioral Intention	0.368	0.247	0.083	0.092	0.730
H2a	Hedonic Value → Per. Preference Fit	0.236	0.338	0.071	0.093	0.704
H2b	Creative A. Value → Per. Preference Fit	0.580	0.434	0.056	0.100	1.237
H3b	Hedonic Value → Behavioral Intention	0.078	0.357	0.094	0.092	1.497
H3c	Creative Value → Behavioral Intention	-0.058	0.429	0.085	0.101	2.861
H4	Creative Value → Hedonic Value	0.249	0.286	0.079	0.069	0.241
H5a	Inform. Quality → Hedonic Value	0.337	0.450	0.073	0.058	0.785
H5b	Toolkit Quality → Hedonic Value	0.124	0.241	0.082	0.058	0.738
H5c	Service Quality → Hedonic Value	0.086	-0.148	0.072	0.079	1.613
H6a	Inform. Quality → Creative A. Value	0.191	0.108	0.072	0.067	0.580
H6b	Toolkit Quality → Creative A. Value	0.525	0.526	0.052	0.066	0.011
H6c	Service Quality → Creative A. Value	0.178	0.246	0.070	0.049	0.504
H7	Service Quality → Behavioral Intention	0.341	-0.354	0.069	0.058	5.160

Gr.1: Group 1, i.e. group did not perceive the presence of live help; Gr. 2: Group 2, i.e. group did perceive the presence of live help

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[335] Sarstedt et al. (2011, p. 200)

[336] Sarstedt et al. (2011); Keil et al. (2000); Chin (2000)

[337] Chin (2000)

5 Findings

"Research is creating knew knowledge."

– Neil Armstrong

The present chapter details the findings and interpretations of the data analysis. It is divided into two sections. The first section focuses on research question one regarding the antecedents and consequences of customers' perceived co-design value in the online customization system. The second section addresses research question two regarding the impact of higher social presence through live help on the entire model. Findings are reported along the results of PLS analysis of the validated structural equation model and its hypothesized relationships. Each of the two sections are further split into two subsections as detailed in the following.

5.1   Assessing Customers' Perceived Co-Design Value

In order to assess antecedents and consequences of customers' perceived co-design value, the final results of the PLS modeling are presented in figure 21. This figure reports the path coefficient ß, the t-value and the significance level for every hypothesized relationship *H1* to *H7* in the structural equation model.[338] In addition the coefficient of determination (R^2) for the endogenous variables is depicted in the figure. Those results are interpreted below in two steps. First the consequences of customers' perceived value are interpreted followed by the antecedents. Hypotheses are evaluated step-by-step applying the results of the statistical analysis.

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[338] Three levels of significance are provided: * = 95% (t > 1,96 and p-value < 0,05); ** = 99% (t > 2,59 and p-value < 0,01) and (ns) = not significant.
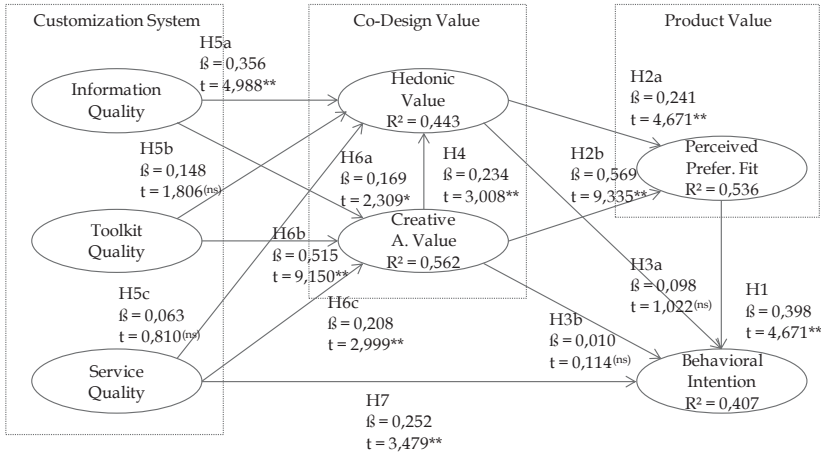
Figure 21: Structural equation model and results of PLS analysis (entire sample)

5.1.1 Consequences of Co-Design Value

Regarding the consequences of customers' perceived co-design value, it can be reported that hypothesized effects *H2a* (ß= 0.241; t = 4.671**) and *H2b* (ß = 0.569; t = 9.335**) show a significant impact on perceived preference fit, i.e. the custom product, and thus can be confirmed. Hence both co-design components, i.e. hedonic and creative achievement value, positively impact the user's perception of the fit between the desired characteristics of the product and their personal preferences in terms of size, fabric or colors. This finding is in line with studies conducted by Merle et al. (2008) and Ihl et al. (2006).[339]

Further, perceived preference fit can be identified as one major driver of behavioral intention, which considers the probability of the customer purchasing a custom shoe or recommending the customization program to others, i.e. friends. This finding is based upon confirmation of hypothesis *H1* (ß = 0.398; t = 4.671**), which shows a statistically significant t-value on a 99% confidence level. Again, this finding is in line with previous studies by Merle et al. (2010) and Franke et al. (2008).[340]

In addition, the analysis investigated the direct impact of the co-design value on behavioral intention with hypotheses *H3a* (ß = 0.098; t = 1.022[(ns)]) and *H3b* (ß = 0.010;

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[339] Merle et al. (2008); Ihl et al. (2006)

[340] Merle et al. (2010); Franke et al. (2008)

t = 0.114(ns)). In both cases the results do not show any statistical evidence of impact on purchase intention nor on the probability of recommendation. Thus the results of the present study confirm the understanding that the co-design value exhibits an indirect effect on behavioral intention via the perceived preference fit of the product. Put simply, the perceived value of the custom product is the crucial variable for customers' purchase or recommendation intentions. A co-design process which exhibits high levels of fun and creative achievement cannot overcome the product's necessity to fit the customer's preference to receive an order.[341]

Comparing the consequences of hedonic and creative achievement value on the perceived preference fit, interesting findings can be revealed. The path coefficient of creative achievement value exhibits a distinctly higher level (ß = 0.569; t = 9.335**) than the one for hedonic value (ß = 0.241; t = 4.671**). Taking into account the calculated effect size (f² = 0.483 for *H2b* vs. f² = 0.084 for *H2a*) as well as the predictive relevance (q² = 0.289 for *H2b* vs. q² = 0.046 for *H2a*), the impact of creative achievement on the perceived preference fit can be identified as substantially higher than the impact of hedonic value. Thus the creative achievement users perceive while designing their custom product in an online customization environment exhibits substantially more explanatory power in terms of perceived preference fit as compared to hedonic value. This finding is closely related to the study presented by Franke et al. (2010), who investigate online customization systems and the relevance of the "*I designed it myself*" effect.[342]

Further, it can be reported that hypothesis *H4* (ß = 0.234; t = 3.008*) is statistically confirmed with a t-value above the critical threshold for the 99% confidence level. Thus the creative achievement customers perceive indicates a weak explanatory relevance for hedonic value. Nevertheless, this additional confirmation of hypothesis *H4* further strengthens the indication that creative achievement is the major component in customers' perceived co-design value when using an online customization system over hedonic value. Further analysis of the antecedents will clarify what elements of the customization system impact this value component most.

5.1.2   *Antecedents of Co-Design Value*

With regard to the antecedents of customers' perceived co-design value the following can be reported. According to the DeLone and McLean (2004) information

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[341] Frank (2013)

[342] Franke et al. (2010)

system success model, three quality dimensions of the customization system have been investigated, i.e. information quality, toolkit quality and service quality.[343]

Information quality can be confirmed to have a statistically significant impact. Hypothesis *H5a* (ß = 0.356; t = 4.988**) is confirmed on a 99% confidence level whereas hypothesis *H6a* (ß = 0.169; t = 2.309*) is confirmed on a 95% confidence level. Thus the information quality provided in the online customization system impacts customers' perception of hedonism and creative achievement. Taking into account the additional analysis of f^2 (f^2 = 0.131 for *H5a* vs. f^2 = 0.039 for *H5a*) and q^2 (q^2 = 0.082 for *H5a* vs. q^2 = 0.021 for *H5a*), the impact of information quality on hedonic value shows a moderate level and a medium relevance, while the impact on creative achievement is comparably lower and only indicates a low relevance. It could be argued that this difference may be attributed to the alignment of the survey questions. The questions concerning information quality were more oriented toward the online purchase transaction than the co-design process. This may explain the difference in the strength and relevance of the impact.

Next, the impact of the toolkits' quality on hedonism and creative achievement is assessed. The reported results provide confirmation for hypothesis *H6b* (ß = 0.515; t = 9.150**) but not for *H4b* (ß = 0.148; t = 1.806(ns)). Hence toolkit quality proves to have a strong effect (f^2 = 0.438) on creative achievement with a moderate predictive relevance (q^2 = 0.236), while it does not indicate any impact on customers' perceived hedonism. The confirmation of *H6b* may follow an intuitive explanation. When users perceive a sufficient range of options in the toolkit to adapt and configure their desired shoe, they will potentially feel more autonomy and freedom to realize their creative ideas. Thus the creative achievement is strengthened, which is then directly linked to the perception of the preference fit. However, it is interesting to note that the results do not indicate any impact of the toolkits' quality on the enjoyment and fun users may perceive. Perceived fun is frequently applied as a major explanatory variable in studies on customer co-design in mass customization, as shown by the exemplary study by Matzler et al. (2011).[344] The current study does not provide any confirmation for that assumption. Two potential explanations might account for this result. First, it could be argued that the toolkit applied in the quasi-experiment does not meet the current technological advancements in online customization interfaces. Users could perceive the toolkit as outdated in comparison with other online customization programs and thus perceive less fun. Second, it could be argued that

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[343] DeLone and McLean (2004)

[344] Matzler et al. (2011); Son et al. (2012); Dellaert and Dabholkar (2009, p. 69)

perceived fun is of lower relevance for users compared to creative achievement. It is not necessarily a major driver for users engaging in an online co-design process and thus the toolkit may have less explanatory power for this value component. This finding relates to a study by Overby and Lee (2006) who investigate the topic of utilitarian versus hedonic value in general online shopping.[345]

With regard to the impact of service quality on co-design value, the following findings can be reported. No statistical indication is provided to support hypothesis H4c, which considers the impact on hedonism. Hypothesis H5c however is confirmed, i.e. indicating a significant effect of perceived service quality on creative achievement value. However, the effect size as well as the predictive relevance is rather small and as such a substantial explanatory power for the overall co-design value cannot be derived. It may be argued that service quality is not necessarily considered by users experiencing the online customization system for the first time. Instead, users are concentrating on capturing the possibilities of the individual shoe configuration and are not concerned with the service quality until the decision to buy the shoe has been made.

Next, the impact of service quality on behavioral intention is assessed using hypothesis H6. The results seem to confirm this effect ($ß = 3.479^{**}$). However, again, the additional calculations of f^2 and q^2 indicate a rather weak relationship. Hence service quality only adds weak explanatory power to purchase and recommendation intention.

5.2   Assessing the Impact of Live Help

The assessment regarding the impact of live help on customers' perceived co-design value in online customization systems is split into two subsections. First, the adoption of live help for the customization process is evaluated. For this evaluation additional qualitative data sources are gathered, i.e. singular feedback from service representatives as well as qualitative comments from survey respondents. Second, the impact of the sole presence of live help is assessed. In order to fulfill this assessment a multi-group PLS analysis was performed. This analysis compares the perception of users who recognized the presence of live help versus the group of users who did not.

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[345] Overby and Lee (2006)

Table 15: General perception of customization system and live help

Perceived Usage	% of respondents agreed (n)
How did you use the online presence of www.selve.net? (n = 205)*	
I got a rough picture of selve.	47.4% (101)
I searched for the contact data.	19.2% (41)
I viewed various shoe samples.	68.5% (146)
For at least one shoe I designed fabrics, colors and shape.	83.1% (177)
I applied the online foot-type-determination.	38.0% (81)
I saved one preliminary shoe design.	51.2%(109)
I already purchased one pair of shoes online.	5.2%(11)
Presence of selve LIVE HELP (n = 205)	
Did you notice the "Selve live help" service offer?	22.1% (47)
How did you notice the "selve live help" service? (n = 47)*	
via direct contact with selve (e.g. phone, newsletter, show room).	14.7%(5)
via private recommendation (e.g. from friends, acquaintances).	20.6%(7)
via internet and other media (e.g. websites, magazines).	58.8% (20)
via a note on the website (e.g. live help-Tab).	26.5% (9)
another way.	2.9% (1)
How did you use the service "selve live help" at www.selve.net? (n = 47)*	
I viewed the introductory video for selve live help.	19.1%(9)
I denied live help with "no thanks".	4.3% (2)
I clicked the "Maybe later" button at live help.	21.3% (10)
I used live help via text chat.	4.3% (2)
I tried live help via audio/video chat.	4.3% (2)
So far I haven't used live help for consultation.	42.6% (20)

*multiple selections possible

5.2.1   Adoption of Live Help

Over a three-month period, live help was provided to users of the selve customization system. Within this period live help was made available in several ways. At the beginning, live help was made available through a small button, which is called "*Live Help Tab*" on the right-hand side of the customer's browser.[346] Throughout the three-month field study, complementary modes of announcement were added. This gradual process included announcing live help via E-Mail

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[346] Refer to Annex D to get an impression of the interface with live help enabled.

Newsletter, extending operating hours, via a separate banner on the home page, via personal contact with existing customers and finally via a pro-active pop-up window. The latter mechanism significantly increased user awareness of selve live help. It was only provided in the third month of the field study and substantially more users provided feedback on selve live help in the online survey. The pro-active selve live help window was provided to customers who actively used the website for more than two minutes. However, the majority of users refused live help using the *"Maybe later"* or *"No thanks"* buttons as reported in table 16. Having pressed one of these two buttons, no further live help notice was provided to that specific user.

Finally, only few users adopted selve live help for their customization process. Those users however did have prior contact with sales professionals at selve, who explained the new service in more detail. Those users were used to receiving consultations via phone and also frequently visited the website to ask their questions about their desired pair of shoes. They highly valued the new service offer, especially for the possibility to share a preliminary design in real-time via co-browsing. This feature turned out to be the most valuable compared to the real time video contact with a sales professional. One reason was that the audio contact via live help did not work properly due to customer machine settings. Thus the audio consultation took place via traditional phone and live help served as co-browsing technology and provided the video signal to the customers. In those cases a more effective co-design process was observed.

In the interviews with the design professionals, it turned out that questions concerning the shoe configuration could be solved more easily. Thus more time could be dedicated to consultation to proceed in the design process. Hence the co-browsing feature in combination with a direct audio connection, as is possible through traditional phone calls, has received positive feedback from customers and design professionals. Regarding the actual usage of live help, it needs to be stated that most customers are still not aware of this comparably new alternative and do not consider it for their online activities so far. This can also be stated from the responses to the survey. In terms of perceived ease of use as well as perceived usefulness, about 1/3 of respondents provided the answer *"I do not know"*, which was provided as an alternative option besides the available Likert scale. Further, a majority of users either agreed on the ease of use and usefulness of live help as an additional service option. On the question "how likely are you to use live help in the future?" answers were distributed across the entire scale from "not likely" to "very

likely", with the majority of answers in the center of the scale. Thus no clear picture about the potential future use can be derived.

5.2.2   *Presence of Live Help*

The statistical multi-group PLS analysis reveals remarkable results for the impact of live help on the antecedents and consequences of customers' perceived co-design value. These results may be differentiated into two separate effects.

The first effect considers the change in the general perception of service quality. As noted in Table 13, a statistically significant difference can be obtained for hypothesis *H6* (t-value = 5.160), i.e. the relationship between service quality and behavioral intention. Within group 2, which contained the users who recognized live help, the path coefficient turns to a negative algebraic sign in contrast to group 1. This means that in group 2, a higher service quality negatively influences the intention to purchase a custom shoe or recommend the customization program to others. A similar effect, however not statistically significant (t-value = 1.613), can be obtained for hypothesis *H4c*. Here the relationship between service quality and hedonic value likewise turns negative in the algebraic sign for group 2, which indicates that users perceived less fun even though the service quality increased.

Taking a closer look into the changes in the service quality construct of the online customization system and extending the analysis to an item-based level, the following can be reported. In order to identify customers' perceived service quality, three questions were asked. These questions were adapted from the e-quality scale proposed by Wolfinbarger and Gilly (2003).[347] The survey included the following three statements.[348]

- The company is willing and ready to respond to customer needs.
- When you have a problem, the website shows sincere interest in solving it.
- Inquiries are answered promptly.

Answers were provided on a 7-point Likert scale ranging from "I totally disagree" to "I totally agree". For all three items the calculated average of the range of responses is higher for group 2 than for group 1. The question remains as to whether these differences between the groups are statistically significant or not. The appropriate test to check this is the Mann-Whitney U-Test, which can statistically

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[347] Wolfinbarger and Gilly (2003)

[348] Please refer to Annex E to see the final survey questions in the German version.

compare groups with ordinal data, e.g. from Likert scales.[349] This group-specific analysis on all three items of service quality reveals a significant difference on the 95% confidence level for the second question, i.e. the website shows sincere interest in solving a customer's problem ($p<0.05$). Thus it is further indicated that the mere presence of live help significantly influences the user's perception of the customization system in terms of service quality.

However, the higher level of perceived service quality through the presence of live help induced a negative impact on perceptions of hedonism and behavioral intention. It may be argued that the "May I help you?" mechanism actually creates an unwanted feeling of pressure and eventually drives away users from engaging in the online co-design process. This idea corresponds with qualitative comments from various survey respondents who recognized live help. Several users argued that they first need to get acquainted with the online customization program before they might ask for further help. Thus the pro-active addressing of users with the help of the live help pop-up may induce negative effects such as abandonment.

Besides that, a second effect may be derived from the statistical multi-group PLS analysis, which explains a rather positive effect of live help. As reported in Table 13, a statistically significant difference (t-value = 2.861) can be obtained for hypothesis *H2c*, which considers the relationship between creative achievement value and behavioral intention. Likewise, a substantial change in the path coefficient for hypothesis *H2b* can be observed, although it is not statistically significant (t-value = 1.497). With these differences in mind, it can be stated that the co-design value and especially the component of creative achievement indicates a substantially higher impact on behavioral intention in group 2 than in group 1. Thus the presence of live help seems to strengthen the relationship between the customer's perceived co-design value and their intention of purchasing or recommending the program. This finding contradicts previous results, which indicate no direct impact of the co-design value on behavioral intentions, such as purchase.[350] The question remains as to why this effect is observable. One explanation may be that through the presence of live help users become aware of the fact that they are carrying out a creative task, which is ordinarily performed by professional designers. This argumentation relates to the recommendation proposed by Franke et al. (2010), who argue that online

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[349] Mann and Whitney (1947) with significance level of 0.05 and two-tailed test; for item QA03_03 calculated $p = 0.477$; for item QA03_02 calculated $p = 0.03078$; for item QA03_03 calculated $p = 0.17702$

[350] Merle et al. (2008); Ihl et al. (2006)

customization providers need to implement mechanisms to elicit the "*I designed it myself*" feeling.[351] Further, it could be argued that through the increased social presence of design professionals via live help, this feeling is strengthened. Thus the presence of live help may be interpreted as an additional mechanism for giving customers the feeling of being a designer, to be more precise a co-designer. The underlying mechanism is the social presence of professional designers, who are "within reach" for instant feedback even though they are not involved in the customer's process.

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[351] Franke et al. (2010)

6 Discussion

"People don't care how much you know until they know how much you care"

– John C. Maxwell

The present chapter discusses the results of the study and is divided into two sections. The first section summarizes the findings and derives implications for theory and practice. The second section captures important limitations of the study at hand and directly denotes important starting points for future research efforts.

6.1 Summary of Findings and Implications

In response to the research questions and the need to better understand customer co-design in online customization, a set of findings and implications can be summarized.

First, it needs to be stated that from a customer's perspective, perceived preference fit is the major antecedent in explaining purchase intention. It has substantial explanatory power to tell if prospects are likely to purchase a custom product and convert to actual customers. An online customization system which provides an attractive and engaging process of co-design cannot overcome the fact that the entire customization program needs to be able to design and produce a product which fits the personal needs of each single customer. The challenge of addressing heterogeneous customer needs in one customization program in contrast to businesses who rely on pre-configured, i.e. standardized products, persists. From a management perspective this challenge directly relates to the fundamental capability of *Solution Space Development* as proposed in "Cracking the Code of Mass Customization" by the authors Salvador et al. (2009). This means that customization businesses need to:

"identify the product attributes along which customer needs diverge" [352]

to develop an appropriate solution space for their customization program. Merle et al. (2010) deliver a valuable study to better understand and differentiate potential customer needs into higher-order categories. The authors argue that the custom

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[352] Salvador et al. (2009, p. 73)

product may fit the preferences of customers in terms of utilitarian, uniqueness and self-expressiveness aspects.[353]

Second, the current study delivers empirical evidence that customers' perceived co-design value has an indirect effect on behavioral intention via perceived preference fit. Again this finding is in line with previous studies investigating customization programs such as the one by Merle et al. (2008) or Ihl et al. (2006).[354] From the point when customers enter the design process the value of having the possibility to adapt a product directly positively relates to the perception of the preference fit. This direct link between co-design value and perceived preference fit is traceable in the empirical data. However, the co-design value does not indicate an impact on customer purchase intention. Thus an indirect effect of the process value on the behavioral intention is identified. Customers may enter the online customization process, but the point of decision to purchase the product may be decoupled from the design process and even postponed to any later moment in the customer's shopping process. Thus even if the design process exhibits high levels of fun and creative achievement, it may only have an indirect effect on customer purchase intention. Accordingly Merle et al. (2010) state that

> "*efficient customization is not sufficient per se*".[355]

This implies that it is not merely enough to provide an ideal customization process if the solution space is not able to fit the preferences of the customer.

Third, when analyzing the perceived co-design value on a single component level, i.e. hedonic and creative achievement, it can be stated that creative achievement has a substantially higher effect on the preference fit. This is an interesting finding, as several studies frequently investigate perceived fun as a predominant component.[356] Deallert and Dabholkar (2009) for example derive the implication that online mass customizers need to increase perceived fun.[357] The current study indicates that creative achievement perceived by customers may outperform the perception of fun. This finding also links to studies on online shopping for standardized products, where the utilitarian value is identified as a major driver of purchase intention, in contrast to the rather weak relevance of

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[353] Merle et al. (2010, p. 511)

[354] Merle et al. (2008); Ihl et al. (2006)

[355] Merle et al. (2010, p. 503)

[356] Dellaert and Dabholkar (2009); Matzler et al. (2011)

[357] Dellaert and Dabholkar (2009, p. 61)

hedonic value.[358] In addition, this finding directly relates to the "pride-of-authorship" effect identified by Schreier (2006).[359] If customers perceive the feeling of having designed a product on their own, they may attribute more value to the process and the product, because of their pride. This implies that customization businesses should consider more efforts to elicit the customer's feeling of "*I designed it myself*" as Frank et al. (2010) note.[360]

Fourth, considering the value of live help, weak indication has been found that especially the co-browsing feature adds a valuable opportunity to increase efficiency in online customization processes, where consultation is requested. Co-browsing is a form of *shared navigation*, which allows two users to synchronously view and adapt one preliminary product design in the online customization environment. In addition, both users may use their own browser interface, which they are used to controlling, in contrast to the feature of *screen sharing*, where one user shares their entire screen or application with the partner's machine. According to a laboratory study by Benbasat and Jiang (2010), who investigated collaborative online shopping, shared navigation

> "*effectively reduces uncoupling (i.e. the loss of coordination with one's shopping partner) incidents per product discussed and leads to fewer communication exchanges dedicated to resolving each uncoupling incident, thereby enhancing coordination performance.*"[361]

As the data further indicate, a traditional personal consultation via telephone in combination with shared navigation via co-browsing is perceived as valuable by customers and professional product designers.

Fifth, the findings indicate that customers need to familiarize themselves with the online customization program and the possibilities of the design toolkit first. A pro-active provision of help, e.g. through a pop-up mechanism and the message "May I help you?" may lead to distraction of the users from their design goal and may create the unwanted feeling of social pressure. Hence this pro-active mechanism, as it is known from in-store processes, may have negative effects, especially for users exploring the customization program for the first time. Live help may however be an appropriate tool for serving customers who have already proceeded to later stages in the customization process.

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[358] Overby and Lee (2006)

[359] Schreier (2006)

[360] Franke et al. (2010, p. 125)

[361] Zhu et al. (2010, p. 872)

Sixth, the findings indicate that the mere presence of live help as an additional mode for customer service may exhibit positive effects. One positive effect is the overall perception of service quality. As the analysis reveals, providing live help to online users increases their overall perception of service quality, which in turn is a relevant antecedent for the final purchase intention and thus decision. The other positive effect is the perception of creative achievement or pride-of-authorship. Obviously the presence of live help helps users to experience the "I am performing a designer's job on my own" effect. It could be argued that the increased social presence of professional designers is a mechanism which fosters the customer's feeling of being a (real) designer, e.g. in the sense of "I can do it on my own". It seems that the social presence of designers from the customer service team strengthens this feeling. Thus it appears that the presence of live help clearly embodies an additional way to elicit the feeling of "I designed it myself", which comprises a relevant element in online mass customization.[362]

6.2   Limitations and Future Research

A set of limitations need to be considered when evaluating the results of the present study. These limitations cover three areas: the applied research method, the characteristics of the data sample and the statistical analysis. They should therefore be taken into account for future research and confirmation of findings.

Missing randomization and the post-test only design are major pitfalls of the quasi-experimental research method applied. Due to the nature of a field study and the technical restrictions of the technology applied, the feasibility of real randomization and pre-test mechanisms was not given. As a result the two groups, which were compared in terms of the social presence effect, cannot be regarded as equivalent. In combination with the missing opportunity to fulfill a pre-test, the real reason for a change in a causal relationship cannot be tracked explicitly. Hence the internal validity of findings suffer from these pitfalls in the experimental setup. Thus future research needs to consider an experimental setup which can identify the effect of social presence through professional designers on online mass customization.

Besides that, it needs to be considered that the quasi-experimental study addressed only one specific customization program from one company. So far the company Selve primarily focuses on luxury shoes for women. The characteristics of

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[362] Franke et al. (2010)

the data sample in terms of gender distribution mirror this fact, i.e. 91.5% female and 8.5% male.[363] Thus the sample may be considered appropriate for this specific customization program, but certainly cannot be considered representative in terms of a general online customization clientele. It can be stated that comparable studies in online customization suffer from similar limitations, which may be primarily caused by focusing on one specific customization program, as the study by Merle et al. (2008) into the Nike iD program shows.[364] Therefore future research efforts need to consider sets of various customization programs in one study, to account for relevant product-related differences. A good example is delivered by Franke et al. (2010) with their study on the "I designed it myself" effect in the product domains of t-shirts, scarves and cell phone covers.[365] Especially the present study would profit from replication on other customization programs to confirm the effect of social presence on customer perception.

Remarkable findings of the present study include the substantially higher effect of creative achievement compared to hedonism on customers' perceived preference fit. Further, it is argued that the social presence of professional designers strengthens the effect of creative achievement on behavioral intention, such as purchasing. These findings are derived from a variance-based approach, i.e. soft modeling.[366] The applied method of PLS is primarily oriented toward theory development and exhibits a predictive character. It is typically suggested for complex structural equation modeling with a comparably higher number of constructs and has fewer restricting requirements, e.g. in terms of sample size and assumptions about normal distribution of data.[367] Especially for the multi-group comparison, where the second group only consisted of 47 users, the PLS method has been identified as appropriate for the analysis. However, for a sufficient confirmation of causal relationships, alternative methods, such as LISREL, are available.[368] LISREL is a co-variance based method which – in contrast to PLS - is oriented toward theory-testing, i.e. hard modeling. It is generally regarded as a more

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[363] Refer to table 9 to see the characteristics of the sample.

[364] Merle et al. (2008, p. 34); Dellaert and Dabholkar (2009); Ihl et al. (2006)

[365] Franke et al. (2010, pp. 128–129)

[366] Wold (1982)

[367] Urbach and Ahlemann (2010, p. 9)

[368] Fornell and Bookstein (1982)

"established approach with recognized GoF [Goodness-of-Fit] metrics and better parameter accuracy and thus being more frequently accepted for rigorous model validation purposes".[369]

Besides that, it needs to be mentioned that various approaches exist to model and apply the multi-group PLS analysis. As Sarstedt et al. (2011) argue, multi-group PLS is still a rather new field and only few articles focus on the methodological discussion of alternative approaches.[370] Thus the chosen model and application of multi-group comparison for the effect of social presence as a categorical moderator can't be regarded as common sense and needs to be evaluated carefully.

Thus future research should consider replicating the present study and its hypotheses with a substantially increased sample size, a randomized experimental setting and the more powerful approach of analysis to find stronger evidence to confirm or reject the presented results.

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[369] Urbach and Ahlemann (2010, p. 13)
[370] Sarstedt et al. (2011, p. 197)

Part VI – Discussion and Conclusion

1 Summary and Discussion

"Everything should be made as simple as possible, but not one bit simpler."

– Albert Einstein

This thesis investigates processes of customer co-design in the mass customization industry to help companies to increase value perceptions and thus profits. The overall objective was to gain a deeper understanding of how various digital media and service channels impact customers' perceived value. The present chapter summarizes part I to VI of this thesis and discusses the overall findings. Chapter 2 derives implications for the management of customer co-design in the mass customization industry. These implications are based upon the findings gained across the empirical studies and therefore deliver a holistic perspective on the entire research efforts. Finally, chapter 3 identifies and details avenues for further research.

Before presenting the summaries for each part of this thesis, the overall research design is once again presented. Starting with the formulation of the research need, an intensive literature review followed to detail the research question with the help of a theoretical framework. Further, to investigate this question a sequential exploratory research design employing mixed-method was chosen.[371] Hence the main part of the thesis explores the phenomenon sequentially, first through qualitative methods followed by quantitative methods. Part III explores challenges of customer co-design through in-depth case studies, including expert interviews and customer focus groups. Part IV then complements the qualitative phase with an investigation of 115 online customization systems to explore mechanisms for social interaction during preliminary customer design. The results of Part III and IV then lead to the development of the quantitative study on perceived value in online customization and the impact of live help on 205 customers. Finally, part VI presents the elementary insights of this intensive research effort. Figure 22 depicts the key findings of each part embedded within the overall research design of this thesis in a comprehensive visualization.

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[371] Creswell (2008, p. 213)

Foundation	**Part I - Introduction** Customer co-design as the major pin-point for leveraging mass customization.	**Part II - Theoretical Framework** Assumption: Service channels and new media moderate value perception in customer co-design.

Qualitative Methods

Exploration	**Part III - Empirical Study 1** 3 challenges of customer co-design • Encouraging discovery • Fostering creativity • Facilitating reinforcement	**Part IV - Empirical Study 2** 2 approaches for reinforcement in online customer co-design • Social customer co-design • Live customer co-design

Quantitative Methods

Part V - Empirical Study 3

Major findings for customers' perception in online co-design
• Perceived preference fit is the major antecedent for purchase intention
• Toolkit quality and creative achievement value exhibit substantially higher effects on perceived preference fit than hedonic value
• Social presence through live help fosters perceived service quality

Implication	**Part VI – Discussion and Conclusion** • Customer co-design profits from varying levels in social presence • Higher levels of social presence foster discovery and enable reinforcement • Lower levels of social presence strengthen creative achievement and pride

Figure 22: Key findings of each part within the overall research design[372]

1.1   Summary of Each Part

Part I identifies the fact that companies wanting to establish a competitive advantage through mass customization face the challenge to develop attractive and concurrently efficient systems for customer co-design. This challenge is mainly driven by the increasing proliferation of digital media and service channels at the customers' interface, as two illustrative examples in this industry demonstrate. Thus the need emerges to better understand the consequences of this proliferation on the

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[372] Own illustration

value creation process. Based on a better understanding, businesses are able to adjust their customization systems accordingly and are expected to increase profits. Before delving into the research, the following definition of customer co-design was derived based upon previous research in this field.

> **Definition:** *Customer Co-Design describes a development process in which the customer and provider collectively ideate, elaborate and create a design specification for a product, which is purchased by the customer.*[373]

Part I then finishes with an overview of the structure of this thesis. In part II, a literature review is conducted to establish a theoretical framework and to further clarify the identified research gap as well as the overall questions for the subsequent empirical analysis. This review focused on academic publications in research domains of mass customization, customer perceived value and management of service channels. First, the main characteristics and principles of mass customization are presented. Second, the concept of customers' perceived value is introduced. Third, the process of customer co-design is differentiated along its fundamental phases. Fourth, the service channel perspective is added to underline the importance of understanding the impact on customers' perceived value within a customization context. Finally, all concepts are aggregated to form the theoretical framework and visually depict the research gap. Based on that, the following detailed research question was derived.

> *How do service channels and new media impact perceived value in the first stages of customer co-design within the mass customization context?*

A sequential exploratory research design employing mixed-method was chosen to compile the answer through multiple empirical studies. This mixed-method approach was performed sequentially, starting with two qualitative studies followed by one quantitative study, as depicted in the research design.

Part III directly builds upon the theoretical framework and explores challenges of customer co-design driven by the increasing proliferation of digital media and service channels. A major difference between in-store and online processes is the presence of human support. Thus the theory of social presence serves as the

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[373] See chapter 2 in part I for the detailed elaboration of the definition.

theoretical underpinning. The study follows a comparative case study approach. Six in-depth cases of customization programs for in-store as well as online services are chosen. Empirical data were collected from customer as well as from the provider perspective. Thus multiple techniques of data gathering were applied, i.e. semi-structured interviews with managers and service representatives as well as two customer focus groups.

Table 16: Summary of part III with empirical study 1

	Part III – Empirical Study 1: Challenges of Customer Co-Design
Builds on	Part II - Theoretical Framework; This part elucidates the relevant concepts and derives the detailed research question.
Challenge	Increasing proliferation of digital media and service channels require an understanding how this impacts customers' perceived value.
Theoretical Underpinning	A major difference between in-store and online processes is human presence. Thus the theory of social presence is applied.
Research Question	What are the key challenges for achieving high perceived value for customers when applying digital media to co-design processes?
Method used	Exploratory case study approach with grounded theory and constant comparison across cases.
Sample	Six mass customization businesses, with various service channels and digital media (i.e. in-store, online & tablets)
Results	Three key challenges are explored: (1) Encouraging discovery (2) Fostering creativity; (3) Facilitating reinforcement.
Implications	Mass customizers need to consider the level of social presence that service channels and digital media afford to customers.
Next Step	Exploring mechanisms to increase social presence for customer co-design in online customization (see Part IV).

Subsequently the interviews were transcribed and analyzed through methods of coding and constant comparison. The final analysis reveals three key challenges of

customer co-design. (1) *Encouraging discovery* addresses the phenomenon that digital media tend to limit discovery yield. (2) *Fostering creativity* addresses the effect that digital media tend to strengthen creative achievement. (3) *Facilitating reinforcement* addresses the tendency of digital media to neglect direct human feedback and enjoyment. The results may be explained through various levels of social presence between in-store and online customization. Further, an indication is provided that both channels exhibit strengths and weaknesses, which may be considered for adequate integration. Table 16 provides a brief summary of Part III.

Part IV focused on exploring features of and dominant approaches in online customization systems which allow users to request feedback on preliminary designs and receive positive reinforcement to proceed. It builds upon part III, where the need to receive positive reinforcement is identified especially for online customization interfaces, where users prevailingly customize products in isolated interaction with the toolkit. The concept of media richness serves as the theoretical underpinning. The method exhibits a large-scale (n=115) case study of online customization interfaces through multiple investigators. The cross-case analysis reveals that online systems for customer co-design may be characterized in terms of richness. Systems with a high *shareability of design (e.g. screen-sharing or co-browsing)* and a high level of *interpersonal presence (e.g. audio or video chat)* can be considered rich. The analysis further reveals two dominant approaches in the online customization market. Enabling customers to share and discuss designs with peers through social toolkits (e.g. vans.com) or social media (e.g. spreadshirt.de) is one common approach. Enabling users to request help from service representatives through live help is the other approach (e.g. richshawbags.com). The study explores a variety of possibilities to enable online customer co-design, where users may design their desired product together with others. The question remains as to how these various options impact customers' perceived value. Table 17 provides a compact overview of part IV.

Part IV employs a quantitative method to investigate the results and implications of the preceding qualitative studies in part III and IV. Part III refers to a lack of human support in online customization interfaces but emphasizes the strength in fostering creative achievement through self-design activities. Part IV identifies an approach which allows users to request instant human feedback from service representatives through live help. Live help may be composed of features to share the preliminary design a user has prepared and to talk to the salesperson via text, audio or even video chat. The challenge remains to investigate the dominance of creative achievement in isolated online interaction and to asses live help as a

complementary service to support online users in designing their desired products. Thus the study further investigates antecedents and consequences of customers' perceived co-design value in online customization and assesses the impact of increased social presence through live help.

Table 17: Summary of part IV with empirical study 2

	Part IV – Empirical Study 2: Online Customer Co-Design
Builds on	Part III, which identifies the need to explore mechanisms of social presence and reinforcement in online customer co-design.
Challenge	Users are frequently left alone in designing products online. Identifying approaches to reinforce customers to proceed the design.
Theoretical Underpinning	Media for interpersonal communication may be distinguished along the concept of richness. Thus the theory of media richness is applied.
Research questions	(1) What features of media allow users to request feedback through human interaction during online customer co-design?
	(2) What are the dominant approaches by providers to facilitate positive reinforcement through online media in customer co-design?
Method used	Large scale case study with cross-case analysis and multiple investigators to increase reliability of analysis.
Sample	115 online mass customizers in various product categories.
Results	Co-design systems differ in terms of richness. The characteristics *shareability of design* and *interpersonal presence* are relevant.
	Two dominant approaches are identified: *Social Customer Co-design* and *Live Customer Co-Design.*
Implications	Variety of options available to enable social interaction in online customer co-design. Choice depends upon effectiveness.
Next Step	Validating the effectiveness of the approach *live customer co-design.*

A holistic structural equation model is therefore developed gradually. The main dependent variables include perceived preference fit as well as behavioral intention in terms of purchase and recommendation. Hedonism and creative achievement compose the co-design value. Three quality aspects are modeled as major antecedents, i.e. information quality, toolkit quality and service quality. Social presence though live help is modeled as a continuous moderating effect. A quasi-experimental field study in combination with an online survey is employed to gather data from customers. The customization system was provided by selve, whereas the live help system was provided by Vee24. The survey questions were accurately derived from the literature to ensure validity. All in all, there were 205 valid survey responses from users who engaged in the online customization process at the website of selve. Few users applied the live help system and requested direct help. Most of the users who recognized live help however refused the service with the option "Maybe later." To assess the survey data, the method of partial least squares was applied, also referred to as soft modeling. Therefore the results exhibit a predictive character. Results show that toolkit quality and creative achievement value exhibit substantially higher effects on perceived preference fit than hedonic value. However, no direct impact on behavioral intention through a high co-design value could be identified. Social presence through live help significantly fosters users' perceived service quality and seems to strengthen the effect of perceived co-design value on purchase intention. Thus, the study would seem to confirm the hypothesis of part III that that creative achievement plays the major role in online customization. Future studies need to pay more attention to this phenomenon. It may be argued that anonymity and self-design are the prerequisites for perceiving creative achievement. This idea directly relates to the relevance of the "I designed it myself" effect described by Frank et al. (2010).[374] Higher social presence of professional designers through live help appears to strengthen the effect of the co-design value on behavioral intention. It remains open to investigate this effect in greater detail. Table 18 recapitulates the essential aspects of part V.

Part VI then concludes by summarizing the findings of the present thesis. Based on that, managerial implications are derived for the further development of customization systems to increase the attractiveness of customer co-design. Part VI employs a holistic perspective on the insights across the empirical studies. Finally, avenues for future research are presented to end the thesis.

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[374] Franke et al. (2010)

Table 18: Summary of part V with empirical study 3

	Part V – Empirical Study 3: Online Customer Co-Design & Live Help
Builds on	Part III, which reveals the key challenge of facilitating reinforcement and part IV, which reveals a potential approach to this challenge.
Challenge	The lack of human support in customer co-design within online mass customization.
Research Questions	(1) RQ1: What are antecedents and consequences of customers' perceived co-design value in an online customization system?
	(2) RQ2: How does live help and an increased social presence impact customers' perceived value in online customization systems?
Theoretical Foundation	A structural equations model is gradually developed to test causal relationships. Customers' perceived co-design value is differentiated into *hedonism* and *creative achievement*. Dependent variables are *perceived preference fit* and *behavioral intention (purchase and recommendation)*. Quality characteristics of the system are modeled as antecedents. *Social presence* is modeled as a categorical moderating effect.
Method used	Quasi-experimental field study with non-equivalent control group and post test only design.
Analysis	Structural equation modeling with partial least squares method and multi-group comparison.
Sample	205 customers who engaged in an online co-design process. Dependent upon timing and availability customers were able to request live help.
Results	Toolkit quality and creative achievement value exhibit substantially higher effects on perceived preference fit than hedonic value. No direct impact on behavioral intention could be identified. Social presence through live help significantly fosters users' perceived service quality and appears to strengthen the effect of perceived co-design value on purchase intention.
Implications	Creative achievement plays a major role in online co-design and needs more attention. It directly relates to the relevance of the "I designed it myself" effect described by Franke et al. (2010). Higher social presence of professional designers through live help would seem to strengthen this effect.

1.2   Discussion of Overall Findings

Reviewing all particular findings across the three empirical studies conducted yielded interesting clues for an overall discussion. The foundational research question focused on the impact of various service channels and new digital media on the customer's perceived value in processes of co-design. It followed the need to better understand how each channel and medium moderates the value perception in customer co-design to derive implications for a purposeful combination, i.e. mix of online, in-store and mobile service channels and digital media.

This research question is motivated from two perspectives. On the one hand, managers of mass customization businesses face the increasing proliferation of service channels and digital media at the customer interface. This proliferation creates new opportunities and challenges to provide an attractive interface and to manage the co-design process successfully. On the other hand, mass customizers need to cope with the specificities of the customer co-design process itself. In contrast to common shopping processes for non-customized, i.e. standardized products, processes of co-design in the mass customization industry exhibit specific characteristics. The major characteristic is the fact that customers take over the active role as a co-designer, which means that they engage in a creative task to elaborate and specify their own desired product. Nevertheless, this creativity is typically limited by a pre-defined solution space, i.e. the entire set of all potential design options available, which is developed and provided by the mass customizer.

Undoubtedly, online and in-store co-design processes are very different. However, no matter what channel customers choose for the co-design process, the same stages of interaction take place. First, customers are attracted and become familiar with the mass customization business. Second, customers start to explore the solution space and engage in a trial & error process to test various design options. Third, after a certain period of time, customers compile their desired design and finalize the product specification. During the afore-mentioned stages, customers will trade off their perceived benefits such das hedonism, creative achievement and pride-of-authorship with their perceived costs, such as mass confusion, cognitive effort and time effort. The result of this trade-off is the customer's perceived co-design value. As revealed by empirical study 3, increasing customer's perceived co-design value is an important prerequisite for increasing purchase intention, although it cannot outweigh potential flaws in the quality of the custom product.

The remarkable difference between performing these stages online and in-store is the presence of humans and further social elements. In-store processes typically afford support by staff, i.e. design professionals, whereas online processes, in the first instance, afford an isolated interaction between the prospective customer and the interface of the toolkit. Hence in-store is characterized by higher levels of social presence in contrast to online processes, which are characterized by lower levels of social presence.

With empirical study 1, it could be argued that this major difference in social presence has ambivalent effects on customers' perceived value. Two of the three key challenges identified suggest that a higher level of social presence may have positive effects, whereas one challenge addresses a negative effect on customers' perceived value.

The first positive effect of higher social presence considers the process in which customers discover the product solution space. Obviously, customers find it easier to discover the potential solution space if others, i.e. friends, close ones or professionals help them. Having a rough idea about the solution space is a necessary prerequisite for proceeding in the co-design process and engaging in creative actions. Interestingly, digital media such as the frequently provided online toolkits seem to limit the discovery yield, although they are able to display all potential product designs. This seems to be an unwanted dilemma which needs more attention in research and practice. The finding may also be interpreted as a contradiction to the frequently cited phenomenon of mass confusion. Future studies need to confirm whether or not mass confusion is actually a problem of high relevance in online mass customization. Traditional catalogs, in contrast, seem to foster discovery. It may be argued that catalogs exhibit a slightly higher level of social presence compared to online toolkits. One reason may be that within catalogs the customizable products are typically presented with photographs of humans using one of these products. However, this interpretation needs further empirical validation.

The second positive effect of higher social presence concerns the possibility for reinforcement. Reinforcement considers customers' need to receive help in the current design activity or to simply retrieve another opinion on the current design idea. Inarguably in-store processes are typically characterized by the fact that customers may ask for help if they need it. This request may happen spontaneously or be planned ahead in case of a prior appointment, as provided by businesses such as the mass customizer selve. However, to date, online mass customization is mostly characterized by the fact that customers are isolated and do not have the possibility

to request help spontaneously. They may certainly pick up the phone or decide to write an e-mail, but by doing so, the process of designing and thinking about the desired product is interrupted to some extent. Besides, there is a further major difference between requesting help in online mass customization situation and requesting in an in-store situation. The current object of interest, i.e. the preliminary product design chosen in the online toolkit, is not available to the service professional at the time the request is made. Within an in-store process, customers may point to an object and the service professional is able to consider this information instantly. In an online situation however, this information is typically not available, at least not instantly. Further actions need to be taken by the customer, e.g. send an e-mail, copy a specific link, note down a design ID or describe the currently displayed information verbally, to synchronize this information with the service professional and receive valuable support. In-store co-design processes with an extremely high level of social presence facilitate reinforcement and significantly lower the barrier to requesting help in the design process.

Besides the aforementioned positive effects of more social presence, a negative effect was identified. The empirical study in part III revealed that digital media for co-design tend to foster the customer's perceived value of having created something on their own. In this aspect, online mass customizers seem to profit from the fact that the customer applies the online toolkits to design their desired product. Within in-store processes where the customer is elaborating the product design in close collaboration with a service professional, the creative achievement value seems to diminish. Instead, customers tend to attribute the creative achievement to the service professional in charge of the co-design process. This idea, however contradicts existing research which emphasizes the necessity for a mass customization program to elicit the "I designed it myself" feeling, which also directly relates to the "pride-of-authorship" effect.[375] In this vein, it may be argued that online co-design processes profit from the anonymity in the isolated interaction between the user and the toolkit. The findings suggest that users are more likely to experiment with trial & error activities if they do not perceive control by others who might judge their actions and chosen product designs as undesirable. In-store processes are likely to suffer from that negative effect, as the high level of social presence prevents customers from being self-creative, i.e. with in-store tablets. Online mass customizers in contrast profit from the anonymous situation the customers is typically in when interacting with the toolkit from their personal environment.

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[375] Franke et al. (2010); Schreier (2006)

The challenge of facilitating reinforcement in an online co-design process has attracted particular interest from researchers and practitioners. Empirical study two revealed two interesting approaches to overcome this barrier to instant reinforcement in online mass customization. The first approach exhibits the idea to enable processes of *social customer co-design* which build upon a close integration between social media and online toolkits, i.e. so-called social toolkits.[376] Prospective customers could be provided with a toolkit which allows them to share a preliminary product design with others in their personal social media environment. The second approach considers the idea to complement online toolkits with live help systems to enable processes of *live customer co-design*. Live help allows customers to request real-time on-screen support from design professionals, i.e. service representatives, from the mass customization business. One major characteristic of live help is that the customer and the service professional may share their current product design with each other to allow an effective interaction without any further need to synchronize information.

Empirical study 3 investigated the approach of live customer co-design in greater detail and revealed interesting findings to complement the previous discussion. Within this study, live help was modeled as a means to increase the social presence in an online co-design situation. Interested users could request a live help video chat with a design professional from the mass customizer while browsing the website and navigating the toolkit. Interestingly, it was revealed that first-time visitors who were exploring the mass customization program in more detail did not request the video chat at first. The feedback from these users in the study indicated that they were still exploring the design options and did not yet need any direct support. Besides that, the online survey revealed that the creative achievement that users experienced in the product design process was more important than the perception of fun, i.e. hedonism. Both insights in combination further strengthen the interpretation that customers prefer less social presence in trial & error activities and perceive more creativity in online co-design. In contrast it could be observed that customers who were already acquainted with the program or had returned for another purchase highly welcomed the new live help service to receive personal consultation online and finalize the order.

Thus the key learning which can be derived across the empirical studies is that the value customers perceived in the co-design processes may have profited from varying levels of social presence in the first stages of interaction. On the one hand,

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[376] Piller et al. (2012)

service channels and new media with **higher levels of social presence** tend to foster discovery and solution space awareness. Besides that, they facilitate reinforcement and allow customers to gather an immediate second opinion, especially in the final stage of the co-design process. On the other hand, service channels and new media with **lower levels of social presence** foster the perception of creative achievement and the feeling of having created something on your own. Based on the theoretical framework developed in part II, figure 23 depicts the discussion of the overall findings and the key learning.

Furthermore, the results seems to reveal a potential dependency between the customers' needs for high or low social presence and the stage of interaction. It may be argued that in the stage of communication, where the customers engages with the mass customization program for the first time, higher levels of social presence foster solution space awareness and the feeling of acting as a co-designer. Within the stage of exploration however, it could be derived that the customer's perception of creative achievement may be fostered by service channels with digital media which allow for anonymous trial & error activities. This situation is typically known from online mass customization but may also be realized with appropriate in-store tablet solutions. Finally, in the later stage, i.e. configuration, customer co-design may profit from more social presence to enable spontaneous requests to be made and professional help to be given. In-store processes are typically strong in that aspect, in contrast to online mass customization. Live help services may overcome this barrier in the online environment as the findings suggest. Finally, it may be derived that appropriate combinations of various service channels and new media which allow various levels of social presence in customer co-design help to increase the value perceived by customers in mass customization.

Mass Customization

Service Channels and New Media...

...with **higher levels of social presence** foster discovery and solution space awareness. They facilitate reinforcement and allow customers to gather an immediate second opinion.

...with **lower levels of social presence** foster the perception of creative achievement and enable the feeling of having created something on your own, i.e. "I designed it myself" effect.

Process of Customer Co-Design

Communication	Exploration	Configuration
i.e. attraction and first communication with the mass customizer	i.e. exploration of solution space, testing design options	i.e. configuration and finalization of desired design

Customers Perceived Value

- Benefits, i.e. hedonism, creative achievement, pride
- Costs, i.e. mass confusion, cognitive & time effort

Key Learning

Processes of Customer Co-Design profit from varying levels of social presence in service channels and new media to increase benefits and/or decrease costs in terms of customers perceived value.
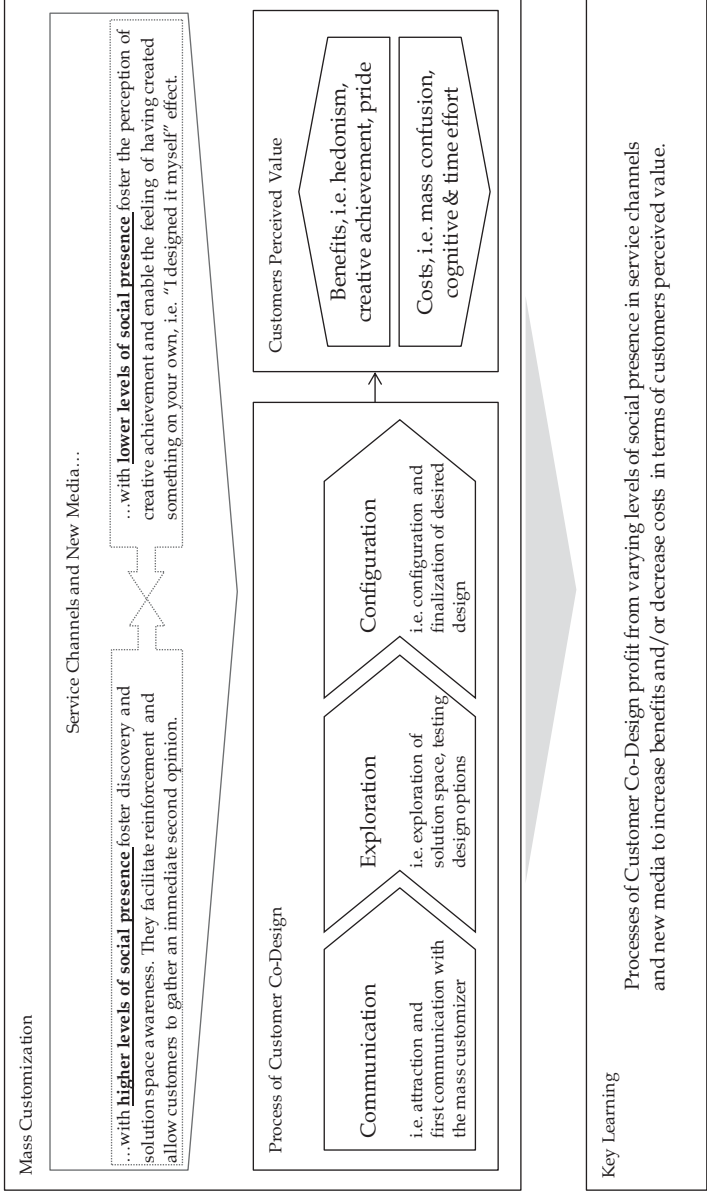
Figure 23: Key learning of the thesis for customer co-design in mass customization[377]

2   Managerial Implications

> *"Simplicity is the final achievement. After one has played a vast quantity of notes and more notes, it is simplicity that emerges as the crowning reward of art."*
>
> – Frédéric Chopin

This dissertation focuses on customer co-design in the mass customization industry. It specifically addresses the question how to increase customers' perceived value across various channels and media of interaction. Based on the results of a literature review as well as three separate empirical studies, this chapter derives managerial implications for businesses engaging in the mass customization industry. These implications are expected to improve the attractiveness of customization programs and thus to increase profits.

The following questions need to be considered for an appropriate combination of new media and service channels and the processes for customer co-design:

1. What are the key challenges in customer co-design across channels?
2. How to enable interpersonal feedback in online customer co-design?
3. What are crucial aspects in online customer co-design?

In the following sections, these questions are discussed in detail.

2.1   What are the key challenges in customer co-design across channels?

In order to increase customers' perceived value in co-design activities across diverse channels, managers need to be aware of three key challenges. These challenges tackle strengths and weaknesses of mass customization programs, which are either carried out online or in in-store. These challenges are:

- *Encouraging customers' discovery* of the mass customization program and their awareness of the potential solution space. Digital media tend to afford a limited discovery yield. In-store as well as catalog-based exploration tend to strengthen customers' awareness of the potential solution space – although the online toolkit is able to display all product variations.

- *Fostering customers' creativity* through self-design activities in combination with an anonymous atmosphere. Online toolkits are strong in activating the necessary trial & error processes to elicit customers' co-design feeling. Digital media for self-guided experimentation, whether applied in-store or online, tend to foster customers' creative achievement.

- *Facilitating customers' reinforcement* through direct human feedback on a preliminary product design. Online interfaces tend to neglect this interpersonal feedback compared to in-store processes, where service representatives or close ones may be asked for instant feedback.

It needs to be recognized that retailers may follow two directions to increase customers' perceived value across channels. One direction involves complementing online channels with in-store mechanisms, e.g. personal human contact and product guidance. The other direction involves enhancing in-store experience with online features, i.e. kiosk or tablet solutions, to provide mechanisms known from the online environment. Once managers decide to complement their online customization program with mechanisms known from in-store processes, they need to understand how to enable such mechanisms.

2.2   How to enable interpersonal feedback in online customer co-design?

In order to enable interpersonal feedback in online customer co-design, managers need to be aware of two fundamental mechanisms. On the one hand customers may gain feedback by sharing and receiving preliminary designs as well as direct adaptations in the design artifact itself, e.g. regarding colors, shapes, sizes etc. On the other hand, customers may receive feedback through comments or other forms of direct communication, which is directly linked to the design artifact. These feedback mechanisms may vary in their quality, dependent upon the features the applied customization system provides. Thus customization systems for interpersonal customer co-design may be differentiated along the following dimensions:

- *Shareability of the design* refers to the extent to which the preliminary design itself is shareable with other individuals, e.g. friends, peers or service representatives. If the system allows two users to share and edit a design synchronously in a common interface the shareability of design is considered

high. If users can't access the current design synchronously and are not able to incorporate their design ideas the shareability of design is considered low.

- *Interpersonal presence* refers to the extent to which the customer perceives the co-design partner as present. Audio or video chats provide high levels of social presence in online co-design, whereas social media and e-mail are considered to have a lower social presence.

Online customization systems, which show a high shareability of design (e.g. through co-browsing or other collaborative features) and high interpersonal presence (audio or video chat) provide a rich environment for online customer co-design. Dependent upon the complexity of the customization program and the product design task, managers need to select an appropriate systems for their desired online co-design process. In case of complex customization programs, rich systems for online co-design should be selected (i.e. high shareability of design and high social presence).

Further on managers should be aware of two frequently applied approaches for online customization.

- *Social customer co-design* considers the customers' interaction on their own design activities with partners in their closer social environment, i.e. with friends via social networks.
- *Live customer co-design* considers the customers' online interaction on their preliminary design with professionals from the customization business, i.e. with support of a live help service.

Dependent upon the customer's needs managers may select one of these approaches to complement existing mass customization systems.

2.3   What are crucial aspects in online customer co-design?

Managers need to be aware of the crucial aspects in online customization and live customer co-design to understand antecedents of the customer's purchase intention.

One major aspect concerns the relevance of perceived preference fit in relation to the co-design value. A higher perceived preference fit increases the likelihood of a customer purchasing the product or at least recommending the customization program to others. The customization process itself however does not directly impact intention to buy or recommend the product. Thus business managers need to be aware that:

an attractive co-design process cannot outweigh potential flaws in the mass customization program. *(Aspect 1)*

Hence it may be derived that the product value through better preference fit should to be sufficiently tested in experimental settings, where setup costs for the customization interface and the toolkit are rather low, i.e. in rapid prototyping settings and direct customer contact. This testing should to be carried out independently on the sales channel selected to organize the co-design process, because regardless of where the customer fulfills the necessary design process, the product needs to fit their personal preferences.

Evidence is provided that the selected channel and medium influences the way how customers perceive value from designing a product. Intuitively managers prefer the online channel to decrease the costs of customer contact and to increase anytime/anyplace availability. However, managers need to be aware that the chosen channels impact the way customers perceive value from the design process. Relevant components of the co-design value are hedonism and creative achievement or utilitarian value. It could be revealed that creative achievement plays the major role in online customization and exhibits a larger impact on perceived preference fit than hedonism. Thus for the appropriate selection of the sales, channel mangers need to be aware that:

creative achievement (utilitarian value) outperforms hedonic value in its relevance for perceived preference fit in online mass customization. *(Aspect 2)*

If managers decide to select an online customization interface, customers will profit more from utilitarian aspects than from hedonic aspects. Not surprisingly, the toolkit is the major antecedent for creative achievement. It affects the way customers perceive themselves as being creative. Other channels and media are required to strengthen the relevance of hedonism, e.g. in-store touch points.

In order to overcome deficiencies in online customization concerning interpersonal contact and guidance by design professionals from the business, a live help system may be provided. Live help systems allow online users to request instant help from service representatives and experience a live customer co-design process. Regardless of whether users choose to apply live help or not, it impacts how users perceive the service quality. Thus, managers need to be aware that:

the mere availability of live help increases the customer's perceived service quality, which in turn may strengthen purchase intention. *(Aspect 3)*

Hence live help systems are identified as an appropriate tool to complement online customization interfaces to foster processes of live customer co-design.

Implementing live help as a complementary service requires managers to put special emphasis on communicating the value of this new service. Customers uniformly reported that especially in the first phase of initial contact with the customization program, they would not require instant help. They rather preferred to become acquainted with the program first. Hence managers should be aware that:

> live help in online mass customization is applicable to later stages in the customer co-design process. *(Aspect 4)*

Further, the analysis reveals that live help needs to be differentiated into two feedback mechanisms. On mechanism concerns the shareability of the current customer designs with the design professional, e.g. through screen-sharing or co-browsing. The other concerns the social presence, e.g. via text, audio or even video chat. The analysis revealed that:

> co-browsing in combination with a direct audio contact received most positive customer evaluations and evidently increased the efficiency of the consultation. *(Aspect 5)*

Hence managers interested in enabling processes of live customer co-design need to consider features for efficient design sharing in combination with traditional contact modes, such as telephone.

3   Directions for Future Research

"Customer conversion is dependent on the right customer conversation"

– Rasheed Ogunlaru

This thesis sought to lay out fundamental insights into customer co-design to add to the evolving research stream within the mass customization domain. Although the literature review (part II) as well as the empirical studies (part III to V) help to better understand underlying mechanisms and close a relevant gap in research, directions for future investigations are identified, which remain open. The present chapter provides a brief overview of topics and the appropriate research questions for further research on customer co-design. With this chapter, the present thesis completes this comprehensive research journey on customer co-design and provides attractive starting points for scholars to fertilize further conversations from an academic as well as a managerial perspective. Table 19 summarizes these directions.

(1) Solution space awareness across channels
As outlined in part III, the channel and medium of interaction impacts the way customers become aware of the potential solution space. The solution space encompasses the entire set of combinations and adaptations available for the custom product. As the empirical analysis revealed, traditional media such as catalog and in-store presentations seem to foster customers' solution space awareness. Online systems seem to have deficiencies in this aspect, although every potential combination is configurable by the customer. Future research may investigate the underlying processes in terms of customer solution space awareness and question how it may be fostered through purposeful integration of channels. Experimental settings may be conducted to separate the impact of the channel and the medium on customer perception.

Table 19: Avenues for future research on customer co-design

#	Topic	Research Questions
1	*Solution space awareness across channels*	- How do customers build solution space awareness? -How can solution space awareness be increased across channels?
2	*Creative achievement for in-store processes*	- How is creative achievement induced within in-store processes? - How to design in-store services to increase perceived value of creative achievement?
3	*Shareability of design across channels*	- How to increase shareability of preliminary designs across channels? - How to foster shared navigation for multiple people?
4	*Relevance of online video chat for co-design*	- Does video chat play a major role in future online customer service? - How should video chat features be applied in online co-design?
5	*Differentiating online social presence*	- How can social presence in online environments be differentiated purposefully? - How does the difference between interactive and non-interactive social presence online impact co-design processes?
6	*Communicating the value of live help*	- How to best communicate the value of live help? - How to integrate live help into existing customer services?

(2) Creative achievement for in-store processes

Future research efforts could be dedicated to the question of how the value of creative achievement can be strengthened within in-store processes. As qualitatively explored in part III and quantitatively confirmed in part V, creative achievement is the major component of co-design value in online customization. In contrast, customers reported that the creative achievement perceived in-store is comparably low, because this effort is mainly attributed to the work of the service representatives. However, research emphasizes the relevance of eliciting the customer's role as a co-designer to generate the essential feeling of "I designed it

myself"[378]. Various ideas may already be observed in today's practice such as in-store kiosks with touch interfaces or other well-known consumer technology, such as i-Pads, which may be appropriate to foster a creative achievement and pride-of-authorship effect. It needs to be investigated how these approaches may be seamlessly integrated into guided co-design processes, such as the one at the shoe individualizer selve.

(3) Shareability of designs across channels

As part IV revealed, co-design processes in the online environment profit from the possibility to save, share and re-share specific design ideas. The higher the shareability of the current design, the easier a customer may request concrete feedback from others. So far this characterization of online customization systems is focused on the online environments, including their various instruments such as e-mail, chat or social media. However, customers may want to save and share preliminary designs across diverse channels. Mechanisms such as simple printings, unique Design-IDs or soft-URL entry points for catalog-based designs should be explored and evaluated in terms of their applicability. Based on that, it may be investigated how customers may use shared interfaces and share navigation to collaborate on certain design ideas, e.g. from in-store to mobile or online.

(4) Relevance of online video chat to co-design

As outlined in part IV, chat features as one part of live help services are partly applied by online customization programs. The market for live help systems including chat features is evolving rapidly. Therefore it needs to be differentiated whether the live help service is based upon text chat, audio or audiovisual (video) chat. As stated, the highest social presence can be realized through video chat, as the customer may see the design partner. This situation comprises a major difference to audio or text-based chat solutions. Prior research indicates that the type of chat solution, whether text-based or audio-based, changes the user's perception and impacts satisfaction.[379] Future research needs to add to this and investigate video chat solutions as an alternative or complementary feature. It may be questioned how video chat performs in comparison to text and audio-based chat and how it may be designed to receive acceptance and increase efficiency in online consultation tasks.

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[378] Franke et al. (2010)

[379] Zhu et al. (2010)

(5) Differentiating online social presence

Part V addresses the relevance of social presence to increasing customers' perceived value and to fostering online purchase intention. A live help service was provided to infuse social presence through instant availability of service representatives. This situation is comparable to in-store shopping processes, where customers look for products and may request help when needed. This mechanism may provide a positive environment and enhance the customer's experience even if they do not need help from a service representative. Argo et al. investigate this idea under the notion *mere social presence* in an (in-store) retail context.[380] A major difference persists with situations where customers actually request help and directly interact with the service representatives. This difference may also be acknowledged in online customization programs. Thus it seems necessary to explore various modes of social presence such as interactive vs. non-interactive presence to account for this relevant difference. Further research efforts in online environments should specifically account for this difference and investigate the impacts on co-design processes.

(6) Communicating the value of live help

Within part V live help was applied within an experimental setup to investigate its value for online customer co-design. One major insight was that many customers were not aware of this kind of service form and mostly refused it at the beginning. Based on direct customer contact, service representatives found out that many users did not understand how this service added new value for them. Upon prior contact and further explanation through a service representative, customers applied live help to mutually elaborate on a new shoe design. Based on that experience, customers recognized its added value. Here it may be derived that future research needs to focus on the question of how to best communicate the value of live help to users who had no prior contact with that business. Further, it must be noted that live help may serve as a complementary channel of interaction besides the commonly used forms, e.g. telephone and e-mail. Again, further research needs to tackle the question of how to integrate live help into existing customer services.

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[380] Argo, Dahl and Manchanda (2005)

Parting comment

The present thesis delivers one essential piece of the puzzle to understand the mechanism of customers' perceived value in processes of co-design. Yet it is only one piece and many others remain open as outlined previously. Therefore the conducted research journey encourages further investigations to confirm - but also disprove - the presented results. In any case, it shall provide a fruitful starting point for further conversations to make customer co-design one dominant approach for successful mass customization businesses.

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Annexes

Annex A: Guideline Expert Interviews

Original German Version

I. EINFÜHRUNG

1. Können Sie anhand eines Beispiels kurz veranschaulichen wie der typische Mass-Customization Prozess in Ihrem Unternehmen abläuft?

2. Unser spezielles Interesse gilt nun der Vorkaufsphase (s. ergänzende Grafik). Wie sieht diese Phase bei Ihrem Angebot im Detail aus?

Notiz: Ergebnisse aus der Praxis und der Wissenschaft zeigen, dass die Interaktion mit dem Kunden die Produktivität des Dienstleistungsangebotes beeinflussen kann.

3. Was sind aus Ihrer Sicht die größten Hemmnisse in der Vorkaufsphase und welche Rolle spielt dabei die Interaktion mit dem Kunden?

II. INTERAKTIONSKANAL

Die zunehmende Bedeutung des Internets spielt für die Entwicklung neuer MC-Angebote eine entscheidende Rolle. Studien zu MC befassen sich zum überwiegenden Teil rein mit Online-Konfigurationsprozessen.

4. Welche Unterschiede ergeben sich zwischen der reinen Online-Interaktion und der „Offline" Interaktion z.B. im Ladengeschäft?

5. Welchen Einfluss hat die Wahl des Interaktionskanals auf die Prozessschritte der Vorkaufsphase?

III. COMMUNITIES

Die Bildung von Kundengruppen („Communities") spielt auch bei MC eine wichtige Rolle. Insbesondere im Internet ist ein stark zunehmender Trend hin zu Online Communities, sozialen Interaktionsplattformen und „user-collaboration" erkennbar.

6. Wie bewerten Sie generell die Verbindung von MC-Angeboten mit Communities?

7. Welchen Einfluss haben Communities auf die Prozessschritte der Vorkaufsphase?

IV. REFLEXION/ PRAKTISCHE UMSETZUNG

Abschließend soll die Möglichkeit eines Resümees gegeben werden, sowie Hinweise zur praktischen Ausgestaltung abgefragt werden.

8. Können Unternehmen durch a) den Aufbau und Betrieb von Communities bzw. b) durch gezielten Einsatz von Interaktionskanälen die Vorkaufsphase aktiv beeinflussen?

Ergänzende Grafik

Mass-Customization-Wertschöpfung: Prozessuale Darstellung der Vorkaufsphase
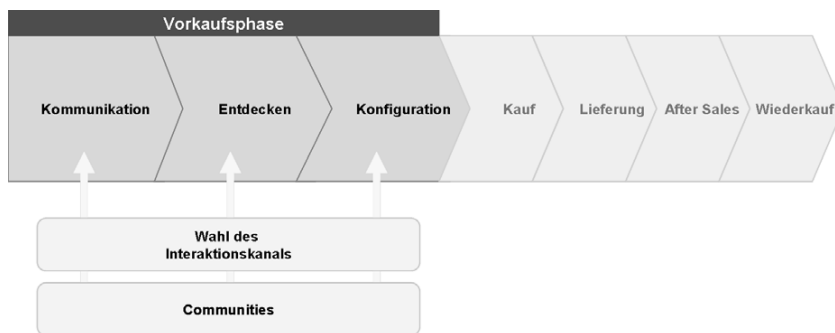
Figure 24: Stages of interaction in mass customization[381]

Herzlichen Dank für Ihre Teilnahme an diesem Interview!

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[381] Own illustration, following Müller (2007, p. 102)

Annex B: Guideline Customer Focus Groups

Original German Version

Einführung und Vorstellungsrunde

Diskussionsanreiz: „Erfahrungsaustausch zum Kauf bei selve"

Wir möchte nun beginnen und als erstes verstehen, wie Ihre Erfahrungen mit dem Einkauf bei selve sind. Wer möchte hier als Erster einsteigen und berichten?

1. **Wie sind Ihre Erfahrungen mit dem Einkauf bei der Firma selve?**
2. **Was muss man wissen um bei selve (oder einem vergleichbaren Anbieter) einkaufen zu können?**
3. **Wo sehen Sie Verbesserungspotenzial bei dem Angebot von selve (oder einem vergleichbaren Anbieter)?**

Diskussionsanreiz: „Erfahrungsaustausch zum Thema Hilfsmittel und Online"

Das Angebot sein Produkt individuell zu gestalten kann ganz unterschiedliche Formen annehmen. Dabei kommen oft auch eine Vielzahl unterschiedlicher Hilfsmittel zum Einsatz, die uns das alles einfacher machen sollen, z.B. Messsysteme/verfahren (Fußtyp-bestimmung), oder auch IT-basierte Konfiguratoren,

4. **Wie sehen Sie den Einsatz von diesen Hilfsmitteln in der Gestaltung eines Produktes?**

Nun wollen wir uns auf einen speziellen Trend eingehen: Es gibt diesen riesen Trend „Online" – d.h. vieles passiert heute im Internet. Wir möchten nun verstehen, wie Erfahrungen mit der Gestaltung von Produkten im Internet ist bzw. welche Meinung Sie dazu vertreten.

5. **Wie sind Ihre Erfahrungen bzw. wie ist Ihre Meinung zur Produktindividualisierung im Internet - am Beispiel selve oder gerne einem vergleichbaren Angebot?**

Diskussionsanreiz: „Erfahrungsaustausch zu gemeinsamen Designs"

Produkte, wie z.B. Schuhe, selbst zu gestalten ist die eine Sache. Oftmals aber gestaltet man Produkte nicht allein sondern lieber zusammen mit Freunden. Wie sehen Ihre Erfahrungen und Meinungen zur gemeinsamen Gestaltung von Produkten aus:

6. **Wie sehen Ihre Erfahrung / Meinungen aus zur gemeinsamen Gestaltung von Produkten?**

Gemeinsam Produkte gestalten kann man natürlich nicht nur Online im Internet. Gemeinsam gestalten und inspirieren kann man auch sehr gut zusammen an einem Ort, z.B. bei selve.

7. **Wie sehen Ihre Erfahrung / Meinungen aus zur gemeinsamen Gestaltung von Produkten im Laden?**

Diskussionsanreiz: „Wünsche nach Kaufabschluss"

Zu guter letzt möchten wir mit Ihnen die Frage diskutieren, „Was Sie sich nach Kaufabschluss gerne wünschen von Ihrem Unternehmen/Anbieter wie selve?"

8. **Was wünsche Sie sich nach dem Kauf bei selve?**

Abschluss und Danksagung

Herzlichen Dank für Ihre Teilnahme an dieser Diskussionrunde.

Annex C: List of Online Mass Customization Providers

Company Name	Webpage	Product	Product Category*
121TIME	www.121time.com	Watches	Jewellery & Bags & Accessories
AktionsLicht	www.aktionslicht.de	Storm Lamps	Household & Furniture
Alphabet Plates	www.alphabetplates.com	Plates	Household & Furniture
Artaic	www.artaic.com	Mosaic tiles	Household & Furniture
ArtYourFace	www.artyourface.com	Canvases	Media
Bivolino	www.bivolino.com	Tailor-made shirts	Made to Measure Apparel
Blancier	www.blancier.com	Watches	Jewellery & Bags & Accessories
BlueWardrobe	www.bluewardrobe.com	Tailor-made shirts	Made to Measure Apparel
Brixels	www.brixels.de	Mosaics	Household & Furniture
Campe & Ohff	www.campe-ohff.de	Tailor-made shirts	Made to Measure Apparel
CarpetCenter	www.carpetcenter.de	Carpets	Household & Furniture
caseable	www.caseable.com	Gadget cases	Look
Case-Mate	www.case-mate.com	Mobile phone cases	Look
Cereal Club	www.cereal-club.de	Cereals	Food & Nutrition
Chocomize	www.chocomize.com	Chocolate	Food & Nutrition
chocri	www.chocri.de	Chocolate	Food & Nutrition
Coco Myles	www.cocomyles.com	Wedding dresses	Made to Measure Apparel
Create–A–Mattress	www.create-a-mattress.com	Mattresses	Household & Furniture
CustomizedGirl	www.customizedgirl.com	Clothing	Fashion
Customized Swimsuit**	www.customizedswimsuit.com	Swimsuits	Sports
damao	www.damao.de	Furniture	Household & Furniture
Dein Bonbon	www.deinbonbon.de	Sweets	Food & Nutrition
Massivkonzept	www.deinregal.de	Furniture	Household & Furniture
DeinSekt.de	www.deinsekt.de	Sparkling wine	Food & Nutrition

Name	Website	Category
Delusha**	www.delusha.com	Jewellery & Bags & Accessories
DerTEEBAUKASTEN	www.derteebaukasten.de	Food & Nutrition
Der Zuckerbäcker	www.der-zuckerbaecker.de	Food & Nutrition
Design a Tea	www.designatea.com	Food & Nutrition
Design Skins	www.designskins.com	Look
Drei Gürteltiere	www.dreiguerteltiere.de	Fashion
Easytissue**	www.easytissue.nl	Miscellaneous
echtleinwand.at	www.echtleinwand.at	Media
eThreads.com	www.elementalthreads.com	Jewellery & Bags & Accessories
Element Bars	www.elementbars.com	Food & Nutrition
Piacemolto	www.fattosumisura.it	Made to Measure Apparel
Fine Cotton Company	www.finecottoncompany.com	Made to Measure Apparel
Finestly	www.finestly.de	Fashion
Frecklebox	www.frecklebox.com	Miscellaneous
Fun-Shirt24	www.fun-shirt24.com	Fashion
GemKitty	www.gemkitty.com	Jewellery & Bags & Accessories
Golfballs.com	www.golfballs.com	Sports
Handysocken**	www.handysocken.ch	Look
Hoogoo**	www.hoogoo.de	Miscellaneous
i.materialise	www.i.materialise.com	Miscellaneous
idbeer	www.idbeer.de	Food & Nutrition
inditailored.com	www.inditailored.com	Fashion
Schoko-Laden	www.krassola.de	Food & Nutrition
Laudi Vidni	www.laudividni.com	Jewellery & Bags & Accessories
Fueg	www.masstisch.de	Household & Furniture
Trendgifts	www.meinebabyflasche.de	Miscellaneous
Mein Lakritz**	www.mein-lakritz.de	Food & Nutrition
Meinxxl.de	www.meinxxl.de	Media
Mel Boteri	www.melboteri.com	Jewellery & Bags & Accessories

Product types (middle annotation per row):

Name	Product
Delusha**	Accessories
DerTEEBAUKASTEN	Tea
Der Zuckerbäcker	Sweets
Design a Tea	Tea
Design Skins	Gadget cases
Drei Gürteltiere	Belts
Easytissue**	Tissues
echtleinwand.at	Canvases
eThreads.com	Handbags
Element Bars	Cereal bar
Piacemolto	Tailor-made shirts
Fine Cotton Company	Tailor-made shirts
Finestly	Bags and belts
Frecklebox	Gifts for kids
Fun-Shirt24	Clothing
GemKitty	Necklaces and earrings
Golfballs.com	Golf equipment
Handysocken**	Cases
Hoogoo**	Football tables
i.materialise	3D prints
idbeer	Beer
inditailored.com	Jeans
Schoko-Laden	Chocolate
Laudi Vidni	Handbags
Fueg	Tables
Trendgifts	Infant gifts
Mein Lakritz**	Sweets
Meinxxl.de	Canvases
Mel Boteri	Handbags

mi adidas	www.miadidas.com	Shoes	Footwear
Milk & Honey	www.milkandhoneyshoes.com	Shoes	Footwear
Modify Watches	www.modifywatches.com	Watches	Jewellery & Bags & Accessories
Mr. Trailmix**	www.mrtrailmix.de	Cereals	Food & Nutrition
muesli 4 ever	www.muesli4ever.de	Cereals	Food & Nutrition
Mueslimixer	www.mueslimixer.com.au	Cereals	Food & Nutrition
MUNICH My Way	www.munichmyway.com	Shoes	Footwear
MY-BABY-SHOP.COM	www.my-baby-shop.com	Infant products	Miscellaneous
My Choc	www.my-choc.com	Chocolate	Food & Nutrition
Taifun-Teppich-Service	www.mymat.de	Doormats	Household & Furniture
mymuesli	www.mymuesli.com	Cereals	Food & Nutrition
MyParfum	www.myparfuem.com	Perfume	Miscellaneous
myprivatecode	www.myprivatecode.com	Canvases	Media
myStofftier.com	www.mystofftier.com	Plush toys	Miscellaneous
MyTeaMix	www.myteamix.de	Tea	Food & Nutrition
My Twinn	www.mytwinn.com	Dolls	Miscellaneous
MyUniqueBag	www.myuniquebag.de	Handbags	Jewellery & Bags & Accessories
Optimalprint	www.optimalprint.de	Cardprints	Media
Pastarie	www.pastarie.com	Pasta	Food & Nutrition
PersonalNOVEL	www.personalnovel.com	Novels	Media
Peter Hutchinson Designs	www.phdesigns.co.uk	Sleeping Bags	Sports
Photolini	www.photolini.de	Canvases	Media
PicturePaper	www.picturepaper.com	Wrapping paper	Miscellaneous
Piksieben.de	www.piksieben.de	Game cards	Miscellaneous
PixelTalents	www.pixeltalents.com	Canvases	Media
posterjack	www.posterjack.com	Posters	Media
Pursenal	www.pursenal.de	Handbags	Jewellery & Bags & Accessories
Custom Reebok	shop.reebok.com/us/custom/your-reebok/	Shoes	Footwear

Rickshaw Bagworks	www.rickshawbags.com	Bags	Jewellery & Bags & Accessories
schrankwerk.de	www.schrankwerk.de	Furniture	Household & Furniture
scurdy.com	www.scurdy.com	Shoes	Footwear
selve	www.selve.net	Shoes	Footwear
Shirtfriends	www.shirtfriends.com	Clothing	Fashion
shirtinator	www.shirtinator.de	Clothing	Fashion
Shirt Magic	www.shirtmagic.com	Clothing	Fashion
Shoes of Prey	www.shoesofprey.com	Shoes	Footwear
Smart Furniture	www.smartfurniture.com	Furniture	Household & Furniture
Smart Jeans	www.smart-jeans.com	Jeans	Fashion
Smip	www.smip.com	Gifts	Miscellaneous
SnackSelect	www.snackselect.de	Snacks	Food & Nutrition
Snamibo	www.snamibo.de	Snacks	Food & Nutrition
SnapTotes	www.snaptotes.com	Bags	Jewellery & Bags & Accessories
Sonntagmorgen	www.sonntagmorgen.com	Coffee	Food & Nutrition
Spreadshirt	www.spreadshirt.de	Clothing	Fashion
Stoff-Schmiede	www.stoff-schmie.de	Fabrics	Miscellaneous
SwimCapz	www.swimcapz.com	Swimcaps	Sports
Tanner+Tailor	www.tanner-tailor.de	Bags	Jewellery & Bags & Accessories
Tee-mixen	www.tee-mixen.de	Tea	Food & Nutrition
Twinkle Kid**	www.twinkle-kid.de	Hats	Fashion
USB-Designer	www.usb-designer.de	Flash drives	Computer & Electronics
Uupsis	www.uupsis.de	Plush toys	Miscellaneous
Viesamie	www.viesamie.com	Sex toys	Miscellaneous
WeLoveFruits**	www.welovefruits.de	Fruits	Food & Nutrition
WOONIO	www.woonio.de	Furniture	Household & Furniture
wunschkeks	www.wunschkeks.de	Fortune cookies	Food & Nutrition
Wurstmix	www.wurstmixx.de	Sausages	Food & Nutrition
Xoddo	www.xoddo.com	Plush toys	Miscellaneous

You Bar	www.youbars.com	Nutrition bars	Food & Nutrition
YOUNiiK	www.youniik.com	Gadget cases	Look
YourSurprise.com	www.yoursurprise.de	Gifts	Miscellaneous
YOUTAILOR	www.youtailor.de	Tailor-made shirts	Made to Measure Apparel
Zazzle	www.zazzle.com	Merchandise	Miscellaneous

* Product categories according to the study "The Customization 500: An International Benchmark Study on Mass Customization and Personalization in Consumer E-Commerce" by Walcher and Piller (2012)

** During the course of analysis businesses were shut down or websites were taken down.

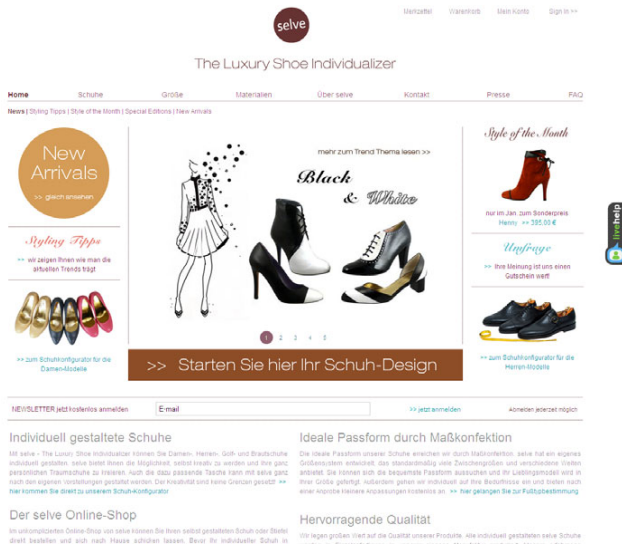# Annex D: Technical Implementation of Live Help Service

Figure 25: Selve website with live help button on the right edge
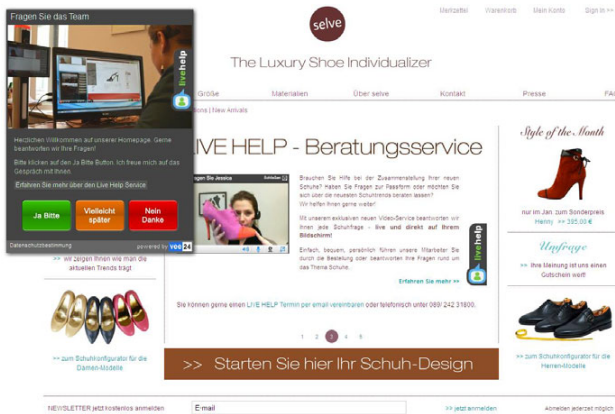

Figure 26: Live help nudge which pops up after a predefined amount of time
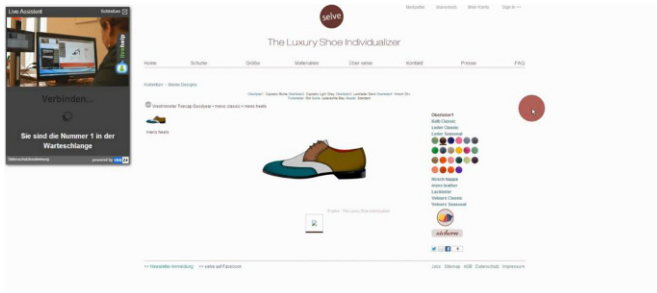
Figure 27: Initializing the video chat and waiting queue

For a more in-depth impression on the technical implementation see the video documentation on vimeo[382].

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[382] Refer to https://vimeo.com/album/2277119; Password: livehelp

Annex E: Online Customer Survey & Questions

Figure 28: Landing page for the survey

Figure 29: 'Thank you' page of the survey

Adapted Question (applied in online survey)	Original Question	Literature Source: Name of Construct
Die selve-Webseite...	*n/a*	
bietet ausführliche Informationen.	The website provides in-depth information.	Wolfinbarger & Gilly (2003): Website Design
erlaubt eine rasche Orientierung,	The website doesn't waste my time.	"
ermöglicht einen schnellen und einfachen Einkauf.	It is quick and easy to complete a transaction at this website.	"
Bei der Schuhindividualisierung empfand ich...	*n/a*	
die Auswahl als genau richtig.	I'm satisfied with the amount of control I have over the customization program.	Deallert & Dabolkar (2009): Control
die Optionen beim Design (Farbe, Materialien und Form) als ausreichend.	Es gab genug Auswahl beim Design (Farben, Signatur) von ... Schuhen.	Ihl et al. (2006): Funktionaler Nutzen; Qualität des Co-Design-Prozesses
die Möglichkeiten hinsichtlich der Schuhgröße (Länge, Weite) als genügend.	Die Auswahl bei den Schuhgrößen (Längen, Weiten) reichte für mich aus.	Ihl et al. (2006): Funktionaler Nutzen; Qualität des Co-Design-Prozesses
Selve vermittelt den Eindruck, dass...	*n/a*	
auf Kundenwünsche reagiert wird.	The company is willing and ready to respond to customer needs.	Wolfinbarger & Gilly (2003): Customer Service
Interesse besteht, Fragen schnell zu beantworten.	When you have a problem, the website shows sincere interest in solving it.	"
Anfragen zeitnah bearbeitet werden.	Inquiries are answered promptly.	"
Mit selve Schuhe individuell zu gestalten,...	*Being able to customize my clothing as described in the scenario,*	Deallert & Dabolkar (2009): Enjoyment
ist interessant.	will be interesting.	"
macht Spaß.	will be entertaining,	"
ist kein Vergnügen.	will not be fun.	"
empfinde ich als unterhaltsam.	will be enjoyable.	"

Beim Individualisieren des Schuhs...	n/a	
konnte ich meine Vorstellungen umsetzen.	Selve gave me a lot of autonomy in the creation of these shoes, and I really enjoyed it	Merle et al. (2010): Co-Design Process Value - Creative Achievment Value
hatte ich das Gefühl etwas Neues zu entwerfen.	By personalizing these shoes, I had the impression of creating something.	„
konnte ich meine Kreativität frei entfalten.	I could give my creativity free rein while designing these shoes, and i really enjoyed it.	„
war ich stolz auf mein eigenes Design.	I am very proud to have designed these shoes by myself.	„
Ein selbst gestalteter Schuh von selve...	n/a	
stellt mich sehr zufrieden.	I am very satisfied with my self-designed shoes from selve.	Franke et al. (2008): Perceived preference fit
ist besser als ein Standard-Schuh.	Compared with the shoe-designs available at conventional stores, I prefer my self-designed shoes from selve.	„
spiegelt meine Idealvorstellung eines Schuhs wider.	My self-designed shoes from selve reflect my idea of an ideal shoe design.	„
Wie wahrscheinlich ist es, dass...	n/a	
Sie einen individualisierten Schuh bei selve kaufen?	If you needed (product type) right now, how likely is it that you would buy your self-designed (product).	Franke et al. (2008): Purchase Intention
Sie selve weiterempfehlen?	How likely are you to recommend … to a friend or colleague?	Keiningham et al. (2007): Net Promoter Score

Applied Question (concerning website usage and presence of live help)	Translated Question
Wie haben Sie das Online-Angebot von www.selve.net genutzt?	*How did you use the online presence of www.selve.net?*
mir grob einen Überblick über selve verschafft.	i got a rough pricture of selve.
online die Kontaktinformationen herausgesucht.	i searched for the contact data.
mir verschiedene Schuhe angesehen.	i viewed various shoes samples.
bei mindestens einem Schuh Materialien, Farben und Form neu gestaltet.	for at least one shoe i designed the fabrics, colours and the shape.
online die Größen- und Fußbestimmung durchgeführt.	i applied the online foot-type-dtermination.
online mindestens ein Schuhdesign gespeichert.	i saved one prelimiary shoe design.
online bereits einen Schuh gekauft.	i already bought one shoe online.
Ist Ihnen das Service Angebot „selve LIVE HELP" aufgefallen?	*Did you notice the service offer "selve LIVE HELP" ?*
Wie sind Sie auf das Serviceangebot selve LIVE HELP aufmerksam geworden?	*How did you notice the service "selve LIVE HELP?*
direkten Kontak mit selve (z.B. Telefon, Newsletter, Showroom).	via direct contact to selve (e.g. phone, newsletter, show room)
persönlicher Empfehlung (z.B. Freunde, Bekannte).	via private recommendation (e.g. from friends, acquaintances)
das Internet oder Medien (z.B. Webseiten, Zeitschriften).	via internet and other media (e.g. websites, magazines)
einen Hinweis auf der Webseite (z.B. LIVE HELP-Tab).	via note on the website (e.g. LIVE HELP-Tab)
einen anderen Weg, und zwar	via another way
Wie haben Sie das Serviceangebot „selve LIVE HELP" auf www.selve.net genutzt?	*How did you use the service selve LIVE HELP at www.selve.net?*
mir das LIVE HELP Einführungsvideo angesehen	i viewed the introductory video for selve LIVE HELP.
das LIVE HELP-Angebot mit „Nein Danke" abgelehnt.	i denied LIVE HELP with "no thanks".
beim LIVE HELP-Angebot auf „Vielleicht später" geklickt.	i clicked the "Maybe later" button at LIVE HELP.
LIVE HELP via Textchat genutzt.	i used LIVE HELP via text chat.
LIVE HELP via Audio/Videchat ausprobiert.	i tried LIVE HELP via audio/video chat.
LIVE HELP bisher nicht zum Beratungsgespräch genutzt.	so far i didn't use LIVE HELP for consultation.