Communities for Co-Design: Customer Collaboration as an Enabler of Mass Customization

ABSTRACT: *Mass customization strategies try to offer customized products and services for broad market segments with mass production efficiency. Every order of a customized offering implies the integration of the customer into the firm's activities during the elicitation process. During elicitation, customers select their individual configuration out of a given solution space. Compared to the rather huge amount of literature on manufacturing systems for mass customization, only little research discusses the role of the customer within the co-design process. Customers, however, face new uncertainties and risks when acting as co-designers. Building on a construction strategy of empirical management research in form of six case studies, we propose the use of online communities for collaborative customer co-design in order to reduce the mass confusion phenomenon. In doing so, the paper challenges the assumption made by most mass customization researchers that offering customized products requires an individual (one-to-one) relationship between customer and supplier. The objective of the paper is to build and explore the idea of communities for customer co-design and transfer established knowledge on community support to this new area of application.*

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1 Introduction

In the mass customization concept, goods and services are produced to meet individual customers' needs with near mass production efficiency (Tseng & Jiao, 2001). The term "mass customization" was coined by Davis (1987) with an explicit reference to Anderson and Toffler. The term was later developed into a business approach by Pine (1993) and many other authors (e.g. Duray, 2000, 2002; Piller, 2003; Wind & Rangaswamy, 2001). It became popular in academia and was adapted as an e-business approach (Fulkerson & Shank 2000; Lee, Barua & Whinston, 2000) or a strategy of supply-chain management (Feitzinger & Lee, 1997; Salvador, Rungtusanatham & Forza, 2004). Research on mass customization is dealing with different issues around developing, producing, and selling individualized products and services for rather large customer segments. Within a mass customization business, customers are integrated into value creation by defining, configuring, matching, or modifying their individual solution from of a list of options and pre-defined components. These *co-design activities* are performed in an act of company-to-customer interaction. In the arena where co-design is performed vendors use so-called toolkits for customer co-design. Von Hippel (2001) defines these toolkits as a technology that (1) allows users to design a novel product by trial-and-error experimentation, and (2) delivers immediate (simulated) feedback on the potential outcome of their design ideas. Today, most of these toolkits are internet-based. Co-design activities are the necessary prerequisite of mass customization in order to fulfill the needs of individual customers. However, these activities are also a major driver for complexity, effort, and perceived risk from the customers' perspective,

limiting the success of a mass customization strategy. Pine coined the term "*mass confusion*" (in Teresko, 1994) as a metaphor to describe the burdens and drawbacks for the consumer as a result of the mass customization interaction processes. We see mass confusion as one major explanatory factor for the delay in adoption of mass customization technologies in business practice.

Discussions with managers from different companies about mass confusion gave us a first indication that interactions between customers could become a means to reduce mass confusion. Case study research then provided additional evidence that customers are able to support each other in a co-design process by jointly performing the design process or giving each other feedback and inspiration during this process. This notion of collaboration in customer groups, however, challenges an implicit assumption raised in most of the literature on personalization and customization: (mass) customization and personalization is about offering individual customers a customized product or service according to their personal needs (e.g. Riemer & Totz, 2003; Rieck, 2003; Squire, Brown & Cousins, 2003; Wind & Rangaswamy, 2001).

In this article we challenge the assumption that offering customized products requires an individual (one-to-one) relationship between the customer and the supplier. We argue that individuality does not always mean one-to-one. On the contrary, collaboration among customers in online communities (and not directly with the online merchant) can help to overcome the mass confusion phenomenon of customized products. We will introduce the concept of a collaborative customer co-design environment which aims at reducing mass confusion. In this context collaborative customer co-design refers to the use of toolkits for customer co-design which are used mutually between different actors. Using dedicated design toolkits, customers can jointly work on a customized variant, either delivered to just one member of the group or to all of them.

Collaborative co-design can foster creativity and lead to better choices of individual customers which are forced to select from a high variety of choices. Breaking down the barriers among toolkit users could also open several possibilities for reducing the uncertainty associated with the co-design process from the customer's perspective. User communities may generate information about possible customized solutions as well as about the design process and the use of the toolkit itself.

Our work is both conceptual and exploratory. We conducted a literature review on "mass confusion" and performed a meta-analysis of empirical findings on current practices in customer co-design. We use data from exploratory case studies to outline how *collaboration in communities* can contribute to reduce mass confusion and to help customers to co-design a customized product. In doing so, we will further transfer established knowledge on the use of communities in e-business environments (*communities of transaction*, Schubert, 1999) to a new application area – "*communities for co-design*". Thus, this paper contributes to the literature by addressing the novel and relevant question of how the burdens of co-design activities from a consumer's perspective can be decreased by performing the co-design task in a collaborative mode within a dedicated community for co-design. This question is relevant for companies offering customized products when they (re)design their configuration and sales systems. We selected empirical support from extended case study research for the discussion of our assumption that collaborative rather than individual co-design activities are a promising way to increase the overall value of customization for consumers and derive recommendations for companies that offer mass customization.

2 Empirical Background: In-depth Case Studies

In order to create a solid basis for our argument we conducted an in-depth case study research in six different domains. Our research builds on experiences from an ongoing field research project on collaborative co-design environments. The project is a long-term cooperation with a number of businesses performing mass customization. Our analysis follows the "construction strategy of empirical management research" formulated by Kubicek (1977). It looks at management research as a design science that does not stop with normative suggestions but aims to pilot and evaluate design suggestions in field experiments in order to generate real world experience as a basis for theory development (see also Gummesson, 2000). This implies longitudinal research in order to detect cause-effect-relationships in real world settings (Van de Ven, 2002). We followed the three steps of case-study based empirical research proposed by Gummesson (2000) to build and support our findings (this approach is also described in Berger, Piller, Möslein & Reichwald, 2003).

Step 1: Starting from a basic conceptual understanding in the beginning, we jointly developed the in-depth case history of collaborative customer co-design for two lead cases: adidas-Salomon and Lego. The objective was to explore specific challenges in the context of collaboration and customization ("*Exploration I*"). This step gave us a deep understanding of the specific collaboration challenges for co-design interfaces. The cases have two different perspectives:

(1) *adidas-Salomon AG*, a German sports goods company, operates a successful mass customization program ("mi adidas"). However, customer surveys indicate a lack of support for customers to reduce the burdens of co-design for customers. However, we could observe that existing communities of adidas customers (not controlled by the company, e.g., running

clubs or football enthusiasts) use public online communities on sports to discuss the potentials and drawbacks of mi adidas products and to exchange ideas how to utilize the customization options offered by the program.

(2) *Lego System A/S*, a large producer of pedagogical toys headquartered in Billund, Denmark, actively encouraged users to create communities and exchange ideas in the process of introducing their mass customization offerings (e.g., Lego Mosaic, Lego Custom Trains). The company provides special software for children to virtually create Lego models and share these models online with friends and discuss about look, functionality, etc. Once this "community of friends" approves a new model, the custom creation can be ordered at Lego.com where it will be commissioned in a dedicated factory specifically for the developer (the child).

Step 2: After analyzing these two cases, we saw the opportunity for communities to support mass customization and developed our first ideas for the design of those communities for customer co-design. Building on case research we explored a specific case study database maintained by our research group. The database contains more than 250 in-depth case studies of mass customizing companies, covering experiences from more than fifteen years. Our objective was to identify other cases using collaborative approaches for customer co-design ("*Exploration II*"). In this step, we identified four other cases: two cases about B2C internet applications, MyVirtualModel and Usertool.com, and two companies using communities for customer co-design in offline environments: American Eagle, a US clothing retailer, and Swatch Via Della Spiga, a design store of the Swatch company in Milan, Italy. We felt that learning from offline communities could provide important insights into the tasks performed in a co-design community. Table 1 provides an overview on all six case studies used in the research.

Step 3 builds upon what we learned from Exploration I and II and aims at the implementation and evaluation of a pilot application for a community for customer co-design at mi adidas. We are in the process of developing an improved mi adidas customer interface based on the newly developed conceptual understanding. Accompanying cross-industry evaluations will help us to further refine the new interface.

Case	**Mass Customization Program**
adidas-Salomon AG *(online / offline)*	mi adidas program to offer customized sports shoes in relation to an individual customer`s feet measurements, customized cushioning, and co-design in regard to the aesthetic design.
Lego *(online)*	Various programs including soft customization (standard sets with interactive software) and hard customization (user specific pre-packaging of sets in the supply chain)
My Virtual Model *(online)*	Using a virtual model to provide a configuration tool for online apparel retailers (e.g., for Land's End)
Usertool.com *(online)*	Customization and user co-creation of games for mobile phones
American Eagle *(offline)*	Customization of ready made garments using after-sales applications (sewing, cutting) in the retail store
Swatch Via Della Spiga *(offline)*	Customization of Swatch watches in a build-to-order system where customers are included in the production process in dedicated workshops in the retail store

Table 1: Exploratory case studies used in this research

In the rest of this article we will focus on presenting the results of Step 1 and Step 2. That is, we will discuss our findings in the context of the application domain (mass customization, avoiding mass confusion) and the proposed solution (online communities). The result of this will be some lessons for designing mass customization support and for using online communities for customer co-design. Therefore, we first further analyze the reasons for mass confusion and then review the possibilities (online) communities offer to address these.

3 The Customer's Perspective: High Variety or Mass Confusion?

3.1 Customer Co-Design

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 (Khalid & Helander, 2003; Tseng & Du, 1998; von Hippel, 1998). As a result, the customer chooses an individualized combination of product specifications from an infinite set of options. During this process of elicitation, the customer is being integrated into the value creation of the supplier. The customer becomes a co-producer or "prosumer" (Toffler, 1980). However, as the main part of the interaction with the customer takes place during the configuration and therefore the design of a customer specific product, it seems appropriate to call the customer rather a co-designer than a co-producer. Customer co-design is a distinctive principle of mass customization (Piller, 2003) and the source of its competitive advantage. Co-design can also lead to a complex, risky and uncertain buying situation that could deter customers from participating in this process.

Customer co-design is performed with the help of dedicated tools (Franke & Piller, 2003; Khalid & Helander, 2003). These systems are the primary instrument for reducing transaction costs and for creating a positive design experience. Known as configurators, choice boards, design systems, toolkits, or co-design-platforms, these systems are responsible for guiding the user through the configuration process. In these systems, different variants are represented, visualized, assessed, and priced with an accompanying learning-by-doing process for the user (von Hippel, 2001). Whenever the term "configurator" or "configuration system" is quoted in literature, it is used for

the most part in a technical sense addressing a software tool. Taking up an expression from von Hippel (2001), we use the term “toolkits” for customer co-design in the following.

3.2 Utility versus burden of mass customization

For customers, the decision to buy a customized product is basically the result of a simple economic equation (Franke & Piller, 2003): The higher the perceived (expected) benefit (returns) from the product compared to the (expected) cost, the higher the likelihood of a customer employing mass customization. *Returns* are twofold: Firstly, the value of a customized product, i.e. the increment of utility that a customer gains from a product that fits better to her needs than the best standard product attainable (Tseng & Du, 1998), and secondly possible rewards from the design process such as flow experience or satisfaction with the fulfillment of a co-design task (Novak, Hoffman & Yung, 2000).

Costs of mass customization for consumers are (i) the premium a customer has to pay for the individualized product compared to a standard offering and (ii) the drawbacks of the customers’ active participation in (integration into) value creation during the configuration process. We focus our discussion on the latter “costs” of co-design as research shows that consumers in many cases are willing to pay a high monetary premium for a customized product (Dellaert & Stremersch, 2005; Franke & Piller, 2004). Co-design activities can result in the perception of extended complexity and additional effort during the buying (configuration) process. Especially in consumer markets, customers often do not have sufficient knowledge for the definition of the product specification that corresponds to their needs (Huffman & Kahn, 1998; Liechty, Ramaswamy & Cohen, 2001). Only few authors have studied the co-design process of customers

of mass customization offerings. Table 2 provides a summary of empirical studies available in this area (see Franke & Piller, 2003 for a review of toolkit related research).

Reference	Research question, method, sample	Findings
Dellaert (2001)	*How do consumers handle choice of modularized products?* Survey (n=728), simulation; subject of research: customers Tourism: customization of travel packages	Provided they offer modularization, producers of products with structural utility benefits are better off, offering their competitively weaker modules separately while bundling their competitively stronger modules with weaker modules
Dellaert & Stremersch (2005)	*What influences consumers' choice whether or not to participate in different mass customization processes?* Survey / experiments (online consumer panel of n=431); subject of research: customers; design toolkit for mass customized PCs ("copy of Dell configurator")	(1) Willingness to use a design toolkit depends on the perceived mass customization utility (function of product utility and perceived complexity when going through a co-design process). (2) Tension between product utility and perceived process complexity as drivers of mass customization utility. (3) Negative effect of perceived process complexity on product utility.
Franke & Piller (2004)	*How does willingness to pay (WTP) differ between user-designed products and standard products? Does "mass confusion" affect WTP?* Survey / experiments (n=165, n=155, N=220); subject of research: customers, online design of a watch	(1) Despite large variety of choice, users demand more options. (2) Willingness to pay for user-designed products is higher than for comparable best-selling standard models in the same market.
Huffman & Kahn (1998)	*Does complexity inherent with a wide number of options lead to customers' dissatisfaction "mass confusion"?* Survey / experiments (n=79 and n=65); subject of research: customers: (a) Customization of stay in hotels; (b) Customization of sofa	(1) Attribute based presentation is preferred to alternative based presentation of customization items; (2) Process satisfaction is related to degree of input in an inverted u-shaped fashion (3) Retailers should explicitly inquire customer's preferences and help consumers to learn their own preferences
Kamali & Loker (2002)	*What influences satisfaction and willingness to pay of consumers using online mass customization toolkits?* Survey / experiments (n=72); subject of research: customers, on-line involvement of consumers in product design of a T-shirt	(1) Higher satisfaction with a web site's navigation and usability as involvement increased. (2) 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.
Oon & Khalid (2001)	*How does web site design and usability of online configurators influence user satisfaction and site efficiency in supporting design activity?* Survey (n=48); subject of research: customers, Three mass customization web sites (clothes, watches, bicycles)	(1) In comparison to other sites, Idtown was found to be significantly flexible to navigate (during configuration); however, users complained about too little information. (2) Highest willingness to purchase product at Idtown side. (3) Hierarchical structure of product components allows users to complete the design (configuration) task better

Table 21: Empirical research on customer co-design

From this review, we could identify three different problem categories, illustrating the sources of mass confusion from the customers' perspective. To illustrate these sources of mass confusion, Table 3 matches them to problems of customer interaction and consumer choice as observed in our six case study companies.

(1) Burden of choice. One limit of mass customization often quoted is that *excess variety* may result in an external complexity (Franke & Piller, 2004; Huffman & Kahn, 1998; Kamali & Loker, 2002; Oon & Khalid, 2001). Users might be overwhelmed by the number of possibilities. Everyone who has experienced decision situations in the face of numerous possibilities for choice – e.g. in a Chinese restaurant facing a menu with 500 meals – knows that to equate a high number of possibilities with high customer satisfaction would be starry-eyed optimism. The burden of choice can lead to an information overload (Neumann, 1955), resulting from a limited capacity of humans to process information (Miller, 1956). As a result, the configuration process may last quite long, and customers may experience an increasing uncertainty during the transaction. Consequently, users may turn away from the freedom to choose options and decide on the standard (or starting) solution offered by a toolkit (Dellaert & Stremersch, 2005) or they may even frown and turn their back completely.

(2) Matching needs with product specifications. In addition to large variety and the burden of choice, customers often do not have the knowledge nor the skills to make a "fitting" selection, i.e. to transfer their personal needs and desires into a concrete product specification (Dellaert, 2001; Huffman & Kahn, 1998). Even a standard and rather simple product like a pair of adidas sport shoes becomes a rather complex product if one has to decide explicitly between different widths, cushioning options for the insole, patterns for the outsole, and color options. In the case of mi adidas, consumers regularly reported in customer surveys that they are not sure if they have

chosen the right specifications. Also, customers of American Eagle are not sure if their own designs match the latest fashion trend.

(3) Information gap regarding behavior of manufacturer. For many consumers, customizing a product is still an unfamiliar process. In this regard, uncertainty also exists in connection with the possible behavior of the provider (Franke & Piller, 2004; Kamali & Loker, 2002). The cooperative character of the configuration results in an asymmetrical distribution of information – a typical principal agent problem: The customer (principal) orders (and pays) a product she has never seen. Additionally, the customer often has to wait some days or even weeks to get the product. This problem is common for catalog order or online retailers. However, compared to distance shopping of standard goods, customers of customized goods often have much higher problems to claim that they do not like a product after receiving it. Without a clear reference point for the definition of an optimal performance, it is difficult to judge whether a case of warranty arises compared to purchasing standard mass-produced goods.

These three sources of uncertainties can be interpreted as additional transaction costs for customers looking for a customized product. Interviews with the retail partners of the case study companies showed that often consumers perceive these cognitive costs higher than the actual price premium asked for the customized product. One of the most important tasks of a mass customizer is to ensure that the customers' perceived expenditure is kept as low as possible, while the additional benefits of getting a customized solution have to be clearly perceptible. This calls for a careful planning of the co-design process as well as the co-design environment in order to successfully reduce the complexity and risk of the configuration process. Only if customers do not experience "mass confusion", they are likely to place an order within a mass customization environment – enabling firms to actually reap the benefits of this strategy.

Case	"Mass Confusion Problem"*
adidas-Salomon AG	• limited time during offline configuration to explore all design options (2) • high price premium leads to high perceived buying risk (3)
Lego	• limited interaction skills of children to explore all possibilities of products (1)
My Virtual Model	• selection of colors and styles, automatic recommendation based on consumers' capability to model themselves (1) • selection of cut, applications, fashion risk (2)
Usertool.com	• limited creativity, experience (2) • evaluation of user design (2) • unknown future charges of provider to use own game (3)
American Eagle	• complex customization possibilities (1) • style and fashion risk, customization addresses first of all aesthetic design (2) • little support by sales clerks (3)
Swatch Via Della Spiga	• open solution space, allowing own creations of customers without any platform support (1) • style and fashion risk, as customization addresses aesthetic design only (2)

* The numbers refer to the three sources of mass confusion identified from the literature research: (1) Burden of choice, (2) Matching needs with product specifications, (3) Information gap about behavior of manufacturer

Table 3: The mass confusion problem in the exploratory case studies of our research

4 Communities and Collaborative Customer Co-Design

In the literature, solutions to overcome the mass confusion phenomenon can be found within two areas, (1) the development of appropriate toolkits for customer co-design and (2) the introduction of strong customization brands. Many authors comment on the need to develop and implement dedicated toolkits for mass customization (Berger et al., 2003; Dellaert & Stremersch, 2005; Franke & Piller, 2003; Khalid & Helander, 2003; Liechty, Ramaswamy & Cohen, 2001; Novak, Hoffmann & Yung, 2000). The idea is to prevent mass confusion by appropriate interface design and usability, representation and visualization techniques, and the restriction of choice presented

to the customer. Other authors argue that most mass customizers lack a strong branding and demand that dedicated customization brands are being developed, signaling trust (Gummesson, 2002; Rieck, 2003). In the following, we propose a third way to overcome mass confusion: collaborative customer co-design in online communities. Communities and customer-to-customer interaction are often mentioned in the literature as a promising way to abolish some of the hurdles of integrating customers into company activities (Schubert, 1999, 2000). One example, already used a lot in e-commerce sites is supporting social navigation by harvesting user profile information and making this information available to other customers (Munro, Höök & Benyon, 1999; Höök, Benyon & Munro, 2003). Also, discussions with managers from mi adidas and Lego, our two primary case studies, indicated potential benefits of using interactions between customers as a means to reduce mass confusion. The companies observed self-organized customer communities around the companies' products where customers interacted with each others in the course of the elicitation process.

4.1 From Communities of Transaction to Communities for Co-Design

Today, communities are often seen in the context of virtual (online), internet-enabled communities. Research on communities, however, can be traced back to a long time before the rise of the internet or even any existence of electronic communication. Communities have been a concern of many social theorists, scientists and philosophers in the 19th and 20th centuries (Hillery, 1955). In general, a community is made up of its member entities and the relationships among them. Communities tend to be identified on the basis of commonality or identification among their members. This can be a neighborhood, an occupation, a leisure pursuit, or the devotion to a brand (Mc Alexander, Schouten & Koenig, 2002, p. 38). Accordingly, Dyson

(1997) defines a community "*as the unit in which people live, work and play*" (for a discussion of the definition see, e.g. Hagel & Armstrong, 1997; Mathwick, 2002; Preece, 2000; Schubert, 1999). Today, the old idea of communities is reincarnated in the form of virtual communities as the result of increasingly cheaper communication and interaction in a networked world. The internet serves as an enabling technology for human interaction.

Despite of the fact that there is a vast body of literature on virtual communities, there is still no consensus among researchers regarding the appropriate definition for the term (Hillery, 1955; Preece, 2000). There have been propositions for classification schemes (Armstong & Hagel, 1996; Mathwick, 2002; Schubert, 1999), but neither of them has really been accepted and adopted by the scientific community. Two fundamentally different kinds of communities have been discussed in literature: business communities and socially oriented communities. We will focus on the first kind. Hagel and Armstrong were the most prominent authors to discuss the value of business communities. Authors generally acknowledge the potential benefits of virtual communities for business purposes (Armstrong & Hagel, 1996; Barnatt, 1998; Brown, Tilton & Woodside, 2002; Bughin & Hagel, 2000; Hagel & Armstrong, 1997; Horrigan, 2001; Jones & Rafaeli, 1998; Rothaermel & Sugiyama, 2001; Schubert & Ginsburg, 2000; Williams & Cothrel, 2000). In the context of this paper, we are dealing with virtual communities as groups of customers who are drawn to the internet in order to perform online purchasing transactions and collaborate in the process of product purchases.

We refer to them as "*virtual communities of transaction*" (Schubert, 1999). These communities are supported by electronic commerce platforms which offer special community features (such as feedback, discussion, voting, ratings, etc.). Electronic product catalogues often form the core of such electronic shopping environments (e-shop). Virtual communities of buyers and sellers can

be merged in a single locus. This combination of an e-shop (based on an electronic product catalog) and a community platform has been termed "*Participatory Electronic Product Catalogue (PEP)*" (Schubert, 2000). The PEP provides a link between the product description (e.g. a book on amazon.com) and contributions from customers (e.g. a rating, review, recommendation of a particular book). Based on the aggregated customer profiles, special community features become feasible, e.g. recommendation services, personalized newsletters and alerts, chat rooms, etc. The coordination mechanisms are a necessary instrument to leverage subgroup preferences (e.g. using collaborative filtering) and to exploit the intelligence embedded in prior transaction histories and experiences. To provide such vital pathways, systems must support the notion of these virtual communities of buyers as they cultivate the process of a collective awareness.

A "*community for customer co-design*" extends the conception of a community of transaction even beyond a PEP by adding features related to the configuration of customized offerings. Special community features are used to support the individual or collaborative design process. Community platforms, which support communication among people, can be used for collecting information about these people (to be used in automated personalization), for collecting (trusted) comments from users, and for establishing direct relationships and joint learning-processes among customers. By breaking down the barriers among users of a co-design toolkit and involving different customers in a joint interaction process, the customization process can be improved, leading to less mass confusion and, thus, a higher value of the customization offering.

Communities for co-design are similar to "*user developer communities*" or "*communities of innovation*" in new product development (e.g. the Linux developer communities; see Franke & Shah, 2003; Jeppesen & Molin, 2003; Lüthje, 2003; Prandelli, Verona & Sawhney, 2004;

Sawhney & Prandelli, 2000; Wikström, 1996), but differ from those in two aspects. In communities for co-design, almost all customers are members of the community instead of just some lead users as in the case of innovation communities. Second, communities of innovation address the creation of a new solution space, and not the utilization of an existing solution for the purpose of configuration (of a customized product). As a result, in communities for co-design the scope of the collaborative design tasks is geared at the creation of trust, sharing experiences, and is often fostering aesthetic creativity instead of the joint solving of technical problems.

The idea of communities for co-design challenges an implicit assumption of many authors on personalization and customization: (Mass) customization and personalization is about offering each individual customer a customized product or service according to his or her personal needs, resulting from an interaction between the firm and the customer (e.g., Pine, 1993; Riemer & Totz, 2003; Rieck, 2003; Squire, Brown & Cousins, 2003; Wind & Rangaswamy, 2001; Zipkin, 2001). Individual needs of a customer can relate to one or more of the three generic dimensions of customization, (aesthetic) design/taste, functionality, and fit/size (Piller, 2003). In our case studies we could observe that a customization dimension is often influenced by the requirements or constraints of a group rather than that of a single person. Customization in regard to (aesthetic) design is often influenced by peers and the taste of a group rather than by the individual taste of a single person. Customers are not following their own “individual taste” when selecting a customized offer, but are guided by a special design which is likely to appeal to their peers. Often, consumers (especially the younger ones) are trying to copy the look of a role model. This notion was very strong in the cases of American Eagle and Swatch Via Della Spiga. Also the original idea of customizing Lego sets (in the factory for a single consumer) proved difficult as toys are often becoming a role play, getting their value from the interaction possibilities between

one child and her friends in a neighborhood. Children demand matching themes of the toys to play with each other. Also, customization in regard to functionality is often defined by the needs of a group of users. Interface requirements, network effects, security standards, etc. ask for a customized solution that matches exactly the solutions of others, and not just that of a single person. This is the situation at Usertool.com where the self-created online game has to meet specific technical requirements, especially when users play it in a shared environment. In these cases, groups of customers – communities – set or even restrict the range of customization. But communities may also provide support for users during their own customization process, as we will further explore in the following sections. Table 4 provides an overview on the community concepts in the six case studies of this research.

Case	**Collaborative Co-Design**
Adidas-Salomon AG	Today: self organized online sports communities discuss customization options of mi adidas Planned (ongoing project): company-driven online platform for exchange and collaboration between users / potential buyers of mi adidas products
Lego	Virtual design environments where users can exchange models and ideas how to use (standard) building blocks for individual models
My Virtual Model	Use (export) of virtual models in online communities to discuss personal styles and ideas
Usertool.com	Assessment of user developments by other users; online chat room to exchange design ideas
American Eagle	Co-design and co-production of product in workshop (offline) supplied by the company, store layout is build to foster exchange in-between customers
Swatch Via Della Spiga	Co-design and co-production of product in store-based workshop (offline), store layout is built to foster exchange in-between customers

Table 4: Early communities for co-design in the six case studies

4.2 Contributions of communities for co-design to reduce mass confusion

Supporting whole communities instead of individual customers may enable customers to co-design with less burden and effort and to minimize the perception of mass confusion. In more detail, communities could hold three major potentials in the course of customer co-design: (i) the generation of customer knowledge to provide a better starting (pre-) configuration, (ii) the support of collaborative co-design fostering joint creativity and problem solving, and (iii) building of trust and the reduction of the perception of risk. The three potentials will be further discussed in the following sections.

4.2.1 Generation of customer knowledge to provide a better starting point

Research on the choice of consumers using co-design toolkits has shown that the complexity and perceived effort of consumers can be reduced by offering users a starting configuration instead of asking them to start with the co-design process from scratch (Dellaert & Stremersch, 2005; Park, Jun & MacInnis, 2000). To find a good starting configuration is not easy. Often, firms just offer a standard product as pre-configuration. A better way would be, however, to offer a starting solution which already matches the profile of a user, i.e. to personalize the co-design process. The ability to deliver automated personalization rests upon the acquisition of a customer profile and the availability of meta-information about existing options. In this context, knowledge generating processes within a community could become a source for customer data which represent the backbone of such a personalization strategy for mass customization.

Current work on personalization usually focuses on automatic (collaborative) filtering processes in which a single customer does not get in contact with other customers (e.g., the typical Amazon.com recommendation engine). On the contrary, the community setting for customer co-

design empowers an individual design process by sharing knowledge (social navigation; cf. Munro et al., 1999; Höök et al., 2003), providing a better fitting pre-configuration. Applications which realize personalization strategies based on member profiles represent a key strength of communities. Peppers and Rogers (1997) use the term “affinity groups” to describe sub-communities of customers with similar taste. By linking affinity groups with the recorded purchase transactions of a high number of customers, a knowledge base emerges which can be used for the forecast of the future buying behavior of individuals. Additionally, aggregation of customer data is not feasible unless there are low barriers of communication between the customers. Communities can facilitate access to this data. Whereas in traditional (electronic) shopping environments users are often skeptical and cautious to reveal personal information, users often are more willing to share such information in an online community (Schubert & Koch, 2002). Additionally, people tend to spend time in the community, offering possibilities for the system to gain implicit user information by observing their behavior (provided that the users approve this procedure). One of our case companies, MyVirtualModel, applies this mechanism to support the personalization of online apparel shopping. Customers can rate products on a scale from one to five. This information is stored in a database where people with similar patterns of taste are put into affinity groups. Based on the buying behavior of the respective peer group, customers receive recommendations for future purchases without the need to look at a broad range of products. This is a good example of how preference and transaction profiles can support buyers in recurring purchases. Once individual settings have been stored, any future transaction can consist of only one “confirmation click” of the compiled product. As a result, mass confusion in regard to the burden of choice problem may be reduced.

4.2.2 Fostering joint creativity and problem solving

Another interesting option is the provision of support for interactive collaborative filtering where users directly interact on the co-design platform (Twidale, Nichols & Pace, 1997). *Collaborative co-design* refers to a design process that is performed mutually by different actors. Collaboration is one of the (often forgotten) core features of communities and customer behavior in the real world. In (virtual) communities of transaction, recommendations for initial set-up configurations can be provided directly by other users. These configurations can be used for co-design toolkits or selections from possible configuration options. Within a community, knowledge is created and shared collaboratively (Ishida, 1998). Users thus may mutually support each other in finding a solution which fits best to their needs. In addition to this, the evaluation of different options can be supported. This support is given by the users themselves and not by the supplier of the customized good – thus increasing the interaction and configuration efficiency of the supplier as well as the building of trust.

Communities for co-design reflect expert knowledge of customer groups which interact not only with one company, but importantly also with each other. They consist of groups of people who may work together over a longer period of time, have interest in a common topic, and want to create and share knowledge jointly. Unlike the traditional “communities of practice”, however, communities for co-design span organizational rather than functional boundaries to create common knowledge and value (Gibbert, Leibold & Probst, 2002). On a community for co-design, practices evolve in a manner similar to that of communities of practice and “situated learning” (von Hippel & Tyre, 1997) in which learning occurs through people interacting in its context. Learning is often enhanced because people may confront different sorts of clues, gather different kinds of data, use different tools, and experience different pressures in relation to a given

problem. These observations have proofed that, despite their “face-to-facelessness” manner, online communities can carry many of the social abilities many did not believe they could handle. A member of a community benefits from an interactive learning processes in a focused environment in which consumers share similar tools and interact intensively on problem solving.

Twidale and Nichols (1996) investigate this form of collaboration for the task of searching for information. Their findings can also be applied to collaborative customization for mass customization. By using dedicated design toolkits, customers can jointly work on a customizable product, either delivered to just one member of the group or to all of them. Collaborative co-design can foster creativity and stimulate better solutions due to the effect of intrinsic motivation on innovation-related activities (self reward and exchange of information). Early examples of communities of end users *developing* (not co-designing) products jointly came from the sports goods industry. Franke and Shah (2003) found high proportions of innovators in four samples of snowboarders, canyonists, handicapped cyclists, and sailplaners. Here, new product development was not performed by single users alone but was a result of joint efforts of a (real life) community of athletes. In these cases, a collaborative innovation process in a community stimulated innovation.

Another example where we find collaborative design features in a mass customization setting is the non-commercial LEGO User Group Network (Lugnet, www.lugnet.com). Within this community, hundreds of users create virtual and real worlds out of (existing) LEGO blocks, using a powerful configuration system (a CAD system based on the LEGO product architecture). Lugnet is a fascinating example of how users make use of a modular product structure (a typical mass customization situation) in combination with a dedicated interaction system for collaborative co-design to create new products and to foster creativity. The LEGO company is

currently investigating possibilities to use the potential of this community and the community processes in general to support their product marketing and sales – and to enable their regular users (kindergarten and school children) to interact with their products more easily.

Another, much simpler example is American Eagle, an US-based fashion retailer. Instead of investing in customization technologies for the manufacturing process or interaction toolkits which are used before purchasing the product, the firm provides customization *after* the purchase: Selected shops offer special workshop areas where customers can transform from-the-rack-clothes into individual garments with the help of shop assistants (by literally cutting holes in t-shirts and so on). What sounds like an obscure marketing idea proofed to be a large success – mainly because of the joy and experience of jointly post-designing clothing in a group of customers. Customers inspire themselves and get a positive feedback from their counterparts in the shop. They also share ideas and creative inputs. The workshops became major meeting points in shopping malls and increased customer traffic in the stores significantly. The company is now bringing this collaborative co-design solution to their Web site. Swatch (in general not a mass customization company) has recently started to explore a similar approach with a design workshop for customers in Milan's Via Della Spiga. Here, customers can build together their very own watches in a group of friend.

4.2.3 Building trust and reducing customers' perception of risk

Customers of a mass customized product face risks in regard to the fit of their co-design with their real needs and in regard to the behavior of the manufacturer after the order is placed (and often paid). Communities for co-design provide two solutions to reduce this risk. First, a customized solution that is jointly developed by a group of users is often more robust. In a

traditional mass customization system, users have to trust their own configuration skills. In a system of collaborative customization, trust is generated jointly and is thus stronger. Since vendors have a vested interest in the promotion of their products, customers often feel an uncertainty about their behavior especially when receiving recommendations or any kind of marketing information. This problem of asymmetric information may also be addressed through communities of buyers. Users might not always trust the automatically generated system recommendations – a major problem of traditional personalization approaches as mentioned earlier. Trust in recommendations is usually higher when the recommendations stem from peers and are e.g. based on ratings that will affect the provider's reputation. Communities where users can interact with each other can help in generating trusted recommendations. The Participatory Electronic Product Catalog (PEP) is one approach to stimulate customer trust (Schubert & Ginsburg, 2000). The opinions about different product configurations, components and functionalities exchanged in the PEP can be traced back to real people. Even when the recommendations are exchanged automatically, the link to real peer customers and the possibility to check the customers' reputation or contact them helps in building trust in the recommendation and reducing the risks of customization.

Communities of co-design could further enhance trust building and reduce the perceived risk of (potential) buyers of a customized product by bundling word-of-mouth communication. From a marketing perspective, word-of-mouth (WOM) communication consists of informal communication by customers directed towards other customers about the ownership, usage, or characteristics of particular goods or services and / or their sellers. Traditional (offline) word-of-mouth has been shown to play a major role for customers' buying decisions (Richins & Root-Shaffer, 1988). The internet has extended consumers' options for gathering unbiased product

information from other consumers and provides the opportunity for consumers to offer their own consumption-related advice by engaging them in electronic word-of-mouth (Hennig-Thurau et al., 2004). While there is a broad spectrum of information sources, many situations are characterized by a trade-off between reliability and value of information and its accessibility. Supplier information about a product is easily available, however, often biased and not related to a specific need. Professional product information provided by a consumer agency allows the comparison of products regarding their technical characteristics. This information is, however, not applicable in the case of customized products where no reference product exists. The information that is considered to be of the highest value is often information by a trusted user who already has co-designed and ordered a custom product. However, this information is often not available to potential buyers. Communities providing electronic word-of-mouth try to overcome this lack by connecting consumers with experiences on a particular co-design process and customized product with consumers looking for related purchasing information. As a result, this source of mass confusion can be reduced.

5 Discussion

Recently, some companies have introduced mass customization offerings. However, the number and intensity of mass customization applications to date falls far behind the number of publications on mass customization. This gap may result from the customers' perception of complexity, effort and risk during the mass customization process, preventing them to buy a customized product. Based on six case studies and a review of earlier empirical studies, we could identify three sources of "mass confusion" which may hint at explanations for the slow adoption of mass customization: (1) the burden of choice of finding the right option from a large number

of customization options; (2) the difficulty of addressing individual needs and of transferring them into a concrete product specification; and (3) uncertainties (based on missing information) about the behavior of the provider.

In e-business literature, virtual communities are often mentioned as a potential solution to overcome information gaps and uncertainties of online buying. In our interviews, managers indicated that they sense potential benefits of using interactions between customers as a means to reduce mass confusion. Communities for customer co-design can support an individual or collaborative design process, minimizing the mass confusion problem at the same time. The approach of using communities hides a wealth of possibilities which allow consumers to become creative co-designers. In more detail, we identified three community applications to overcome the mass confusion phenomenon: (i) generation of customer knowledge to provide a better starting (pre-) configuration, (ii) support of collaborative co-design fostering joint creativity and problem solving, and (iii) building of trust and the reduction of the perception of risk. Figure 1 displays the match between the "problem solving mechanisms" of a customer co-design community and the three types of mass confusion.

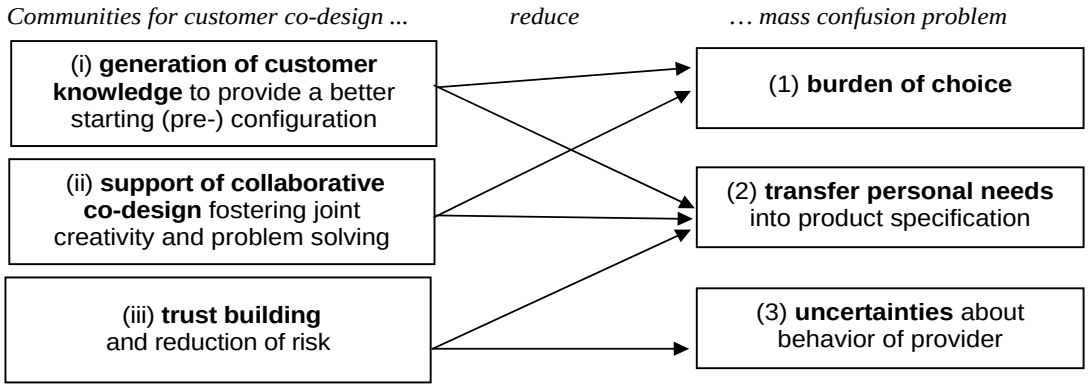

Figure 1: Contributions of communities for co-design to reduce mass confusion problems

Why should users be willing to contribute to a common information pool within a co-design community? Contributing to a community and helping other users in a co-design process bears the risk of free riding (Arrow, 1962). Lessons learned from open source software developer communities show that users are motivated to participate in programming efforts and to contribute to the open source code as a public good, because they can directly benefit from a customized product variant, but also due to factors of intrinsic motivation as well as peer recognition and reputation they can gain in the community (Hars & Ou, 2002; Hertel, Niedner & Herrmann, 2003; Lakhani & von Hippel, 2000). Even if peer recognition and community reputation can not be converted to cash (as in the case of a professional setting of open source programmers) it can be enjoyed for the sake of an "ego boo" in a community for co-design. If these social momentums can be induced in the co-design community, the membership could be considered as part of the product purchased and consumed. This should increase the expected value of customers' and hence their motivation to contribute to the common information pool. From a customer perspective, contributing to an anonymous information pool via the toolkit would remain a simple customer-supplier-interaction, most certainly lacking users' motivation. However, several community features can offer a fruitful interaction of users with each other. Besides the exchange of prototypes, a community can offer features like a "best of"-list to earlier user developments as well as a chat forum for instant communication. Thus, consumers can comment or evaluate contributions by others. These are well known reasons for community-based consumer-to-consumer interactions, as demonstrated by Jeppesen (2002) in the field of computer games. Nurturing a user community can especially be key to the success in order to animate users to create value themselves via the toolkit.

Communities for co-design are a very early phenomenon appearing only recently in business practice. The analysis presented in this paper is exploratory and has a number of limitations which can become starting points for further research. The differentiation of the sources of mass confusion was the result of a literature analysis and observations in the case studies. A more detailed and dedicated empirical study of consumer choice and buying (configuration) behavior during the elicitation process of a mass customization offering could provide a proof of concept. In addition, a contingency perspective (Lawrence & Lorsch, 1967; Miles & Snow, 1978) on mass confusion and the possibilities of customer communities in this regard could offer further insight and a more specific argument regarding the ideal situation for co-design community features. In today's mass customization practice there is only a small number of community applications to support the co-design process. This number, however, is steadily growing. See for example (Koch, Leckner, Schlichter & Stegmann, 2004), (Leckner, 2003) and (Leckner, Koch, Lacher & Stegmann, 2003) for ongoing work in implementing such solutions. Thus, a field for comparative empirical research derives, aiming at identifying success factors, drivers, and enablers of communities for co-design.

Despite these questions for further research, we believe that gaining advantage from customer profiles and the perspective of bringing people together to communicate and interact in a community for co-design is vital to the success of future co-design and mass customization environments. The understanding of the effective use of electronic business media will be an important step on our way to designing a socially and technically efficient virtual environment that suits the needs of buyers and sellers alike.

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