

A multi-channel customer interaction platform for mass customization

Concept and empirical investigation

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Abstract

Mass customization requires a process of co-design between each single customer and the supplier. Therefore, the interaction and configuration platform that enables users to design the desired product is crucial. Despite the fact that all known mass customization systems are at least to some extent IT-based, configuration has not to be limited to pure online interaction systems. In the past years multi-channel interaction platforms emerged, combining online and offline configuration systems as well as electronic and personal interaction. The main characteristic of such platforms is that the mass customizer offers different ways and possibilities for interaction and configuration. The customers themselves decide which channel they want to use according to individual preferences, e.g. product knowledge or configuration experience. There are three main scenarios which are imaginable from the customer's point of view: a pure offline interaction system, a mixed strategy combining online and offline orders, and pure online interaction. The objectives of this paper are threefold: (i) to discuss the options of implementing multi-channel interaction systems, (ii) to

formulate important questions of research deriving from these options, and (iii) to present the layout of an empirical research project aiming to explore customer interaction on such a multi-channel interaction platform in larger detail. In this research, main fields of interest are process patterns of user interaction, user satisfaction, perceived risk as well as value of individualization.

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1. The main enabler of mass customization

The objective of mass customization is to deliver goods and services, which meet individual customer's needs with near mass production efficiency ([1]; [2]; [3]; [4]; [5]). This proposition means that individualized or personalized goods can be provided without the high cost surpluses (and, thus, price premiums) usually connected with (craft) customization. Therefore, mass customization is often connected closely with the capabilities offered by new manufacturing technologies (CIM, flexible manufacturing systems) reducing the trade-off between variety and productivity and hence enabling to decrease the additional production costs ([1]; [6]; [7]; [8]; [9]).

However, new flexible manufacturing systems are a necessary but not sufficient condition for successful mass customization. They have to be supplemented by infrastructures capable of handling the information flow and transaction costs connected with mass customization, which is characterized by a high intensity of information compared to mass production ([10]; [11]; [12]). This information intensity results from the fact that starting point of each customization are specific customer needs. The supplier has to interact with each single customer and obtain specific information in order to define and translate the customer's needs and desires into a concrete product specification. Only over the last years technologies emerged to handle the information flow connected to mass customization. This explains the time lag between the first discussions of the concept in literature for more than a decade (e.g. [13]; [14]; [1]; already [15] described the basic idea), and its practical implementation, which took place only in the last few years. Especially as mass customization enters more and more into consumer markets, new information technologies can be seen as its main enabler ([16]).

By translating individual customer needs in a specific product, the customer is involved into the value creation of the supplier. The customer becomes a "co-producer" respectively "prosumer" ([15]). 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 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 ([17], [18], [19]). A product is co-designed between each single customer and the supplier.

Against this background, the importance of an interaction and configuration platform that enables users to design the desired product seems obvious. Every

transaction in a mass customization system implies information and coordination about the customer specific product design and is based on a direct communication between the customer and the supplier ([20]; [21]). Thus, the main distinctive principle of mass customization is a mechanism for interacting with the customer and obtaining specific information in order to define and translate the customer's needs and desires into a concrete product or service specification ([21]). Companies offering mass customized products have to develop and operate new kinds of customer interfaces and customer interaction systems building an efficient platform for this value co-creation.

These customer interaction platforms are focused in this paper. More precisely, we want to explore multi-channel solutions that offer customers themselves the possibility to choose the preferred interaction and configuration. The paper will be structured in the following way. After this introduction, we will illustrate the importance of interaction platforms for mass customization and the need for offline configuration possibilities and multi-channel systems. Next, we present the layout of an empirical research project aimed to explore customer interaction within such a multi-channel interaction platform in larger detail. In this project, main fields of interest are process patterns of user interaction, user satisfaction, perceived risk as well as value of individualization. Only when these basic issues of consumer configuration behavior are understood, appropriate technical solutions and IT-systems for configuration systems can be found ([22]).

2. The importance of interaction platforms for mass customization

The integration of the customer creates collaboration between the supplier and the customer, which supersedes the traditional value chain. Companies successfully pursuing mass customization build an integrated knowledge flow – that not only covers one transaction but uses information gathered during the fulfillment of a customer-specific order to improve the knowledge base of the whole company ([23]; [21]; [4]). During the whole process the interface between manufacturer and customer is crucial. Not only does it comprise the solution space of the production facilities, but it is also the design instrument for new and existing customers, the core communication tool, and supposed to be the main origin of customer loyalty (e.g. [24]; [25]; [26]).

Additionally, the interaction system is the prime instrument for reducing the user's costs arising from a principal-agent-constellation that is inevitable in mass

customization. From the customer's perspective the co-design is connected with additional costs ([10]; [23]). Users often have no clear knowledge of what solution might correspond to their needs, sometimes they still have to find out what their needs are. As a result, customers may experience uncertainty during the design process. Uncertainty about the behavior of the supplier also exists. The newer and more complex the individualization possibilities are, the more information gaps increase. These processes are characterized by an asymmetrical distribution of information – a typical principal-agent constellation ([27]): Customers (principals) order from a supplier (agent) – and often pay in advance – a product they can only evaluate in a virtual form. Then, they have to wait days or even weeks to receive it. These uncertainties can be interpreted as additional transaction costs of customers arising from individualization. One of the most important tasks of the supplier is to ensure that the customers' expenditure is kept as low as possible, while the benefits they experience are clearly perceptible.

Interaction systems for mass customization are the premier instrument to reduce these costs. Known as configurators, choice boards, design systems, platforms, or co-design-platforms, these systems are responsible for guiding the user through the configuration process. Different variations are represented, visualized, assessed and priced, which starts a learning-by-doing process for the user. While the term "configurator" or "configuration system" is quoted rather often in literature, it is used for the most part in a technical sense addressing a software tool. The success of such an interaction system is, however, by no means not only defined by its technological capabilities, but also by its integration into the whole sale environment, its ability to allow learning by doing, to provide experience and process satisfaction, and its integration into the brand concept.

While configuration possibilities theoretically do not have to be based on software, all known mass customizers are using a system, which is at least to some extent IT-based. Despite a huge variation, the electronic systems within a mass customization interaction platform consist of three main components ([28]; [29]; [4]):

- The core configuration software presents the possible variations, and guides the user through the configuration process, asking questions or providing design options. Consistency and manufacturability are also checked at this stage.
- A feedback tool is responsible for presenting the configuration. Feedback information for a design variant can be given as visualization and in other forms (e.g. price information, functionality test etc.)

and is the basis for the trial-and-error learning of the user.

- Analyzing tools finally translate a customer specific order into lists of material, construction plans, and work schedules. They further transmit the configuration to manufacturing or other departments.

The fact that all systems in use are more or less IT-based means not that they are limited to sheer online interaction systems. Besides the pure electronic way, some multi-channel interaction platforms emerged in the last years combining online and offline configuration as well as electronic and personal interaction. There are mass customizers offering the customer the possibility to create his own individual product, whereas the customer is able to decide how he wants to create it: in a shop or on the company website. The customer chooses the way he prefers according to individual needs. For both distribution channels, shop and website, an electronic interface offers support. When the customer chooses the internet channel, he designs using the interface on his own, while the offline configuration is supported by a sales clerk, who often leads through the configuration and operates the electronic system.

3. The need for offline configuration and a multi-channel approach

Many of the prominent examples of mass customization rely on consumer direct, online sales strategies. Consumer goods companies like P&G or Nike, which normally use multi-level retail channels, sell their mass customized products via internet in direct interaction with their consumers. When Nike started mass customizing with NikeID, it decided to offer this product only via its own website. Apart from lower transaction costs due to the "design it yourself" approach, the main motivation behind this decision was to gain experience in the interaction with consumers on the web. Theory also supports this approach. For individualized goods and services transaction cost theory recommends, at first glance, direct interaction between manufacturer and buyer. Configuration and purchasing should be fulfilled without any intermediaries ([30]; [31]). An intermediary would do nothing more than transfer the product specification to the manufacturer where each order has to be checked, planned and carried out separately. Thus, a retail channel or an own offline sales structure would just add an additional (transaction) cost-generating level, especially as today electronic commerce allows manufacturers to communicate and deal with large groups of consumers directly and efficiently. However, selling personalized shoes online via NikeID is only possible because in this

system consumers can simply choose some customized (aesthetic) design options on a standard model and print their name on it.

Nike competitor Adidas-Salomon allows its customers to create their own unique footwear to their exact personal specifications in terms of fit, function and design. In this regard, Adidas's mass customization program "miAdidas" goes much further than NikeiD as it adds a customization option with regard to fit and functionality. Due to this full customization approach including physical feet measurement, miAdidas products need an offline interaction tool. Many end consumers do not have the necessary know-how to specify an individualized solution, which corresponds to their desires. While, for example, more and more users nowadays have learnt to configure a PC online, only a few may be able to configure for example a pair of sports shoes on their own. Therefore, an important task becomes to assist them during the configuration process. As the final product does not exist during the sales process, the product itself ceases to be the central focus throughout the interaction with the customer. Therefore demonstrating competence in sales becomes one of Adidas' top priorities. This competence is shown firstly by the design of the interaction system, represented by the electronic configurator as one element, but primarily based on the customer's perceived competence of the sales clerk at the point of sale. An additional online interaction site for re-orders and customer relationship management is planned for 2004.

Taking this example, there are a couple of reasons why offline configuration should play a more important and often even dominating role in a mass customization concept despite the recent focus on online configuration engines [32]:

- In many cases existing trade structures frequently offer the necessary customer contact first, since today many potential customers cannot be reached through direct online sales. Even on a medium range planning horizon, a lot of customers are not willing to make their purchases merely through an interactive electronic contact. Wealthy and sophisticated citizens form one of the main target groups of mass customization on the basis of their high demands. These customers want stationary retail.
- An offline configuration possibility is necessary when certain instruments are required for the collection of the customer data. Examples of this are 3D-scanners and measurement systems used in the clothing or footwear industry. Or consider the use of expert systems like that of Japanese optical company Paris Miki, which proposes the design of a new pair of spectacles while discussing with the

customer. Such instruments also contribute to the sensory experience of shopping. In addition, many consumers want to try out their goods before they buy them, not only visually, but by feeling and smelling. Providing offline configuration fulfills customers' needs for shopping experiences, offering not a product but a certain feeling or configuration experience.

- As discussed briefly above, one of the major obstacles of mass customization is caused by the uncertainties and risks from the customer's point of view during the configuration process – resulting from the principal-agent-situation. Especially in consumer markets customers often do not have sufficient knowledge for the definition of the product specification corresponding to their needs. Thus, customers may experience an increasing uncertainty during the transaction process. Comparison processes are more difficult because of smaller transparency of supply compared to standardized goods or services. Here offline interaction can offer a lot of possibilities to reduce the perception of complexity from the customer's point of view.

However, the fact that offline interaction should be considered more than before does not mean that online configuration should be disregarded. Firstly, the configuration for repeat purchases can often be fulfilled very efficiently via internet, based on the existing customer profile. Secondly, new customers can experience and explore the customization possibilities on the internet in order to become familiar with the concept and get an idea of what to expect in the store. Thirdly, a mass customization approach should also be accompanied by a customizable website in order to make it more trustworthy. As a result, neither pure online nor pure offline interaction systems are a solution in many cases. Companies should offer a multi-channel configuration system, leaving the decision about the manner of individualization to the customer, if possible. Several direct and indirect sales forms can be combined – from shops over direct sales by call centers to self-service on the internet. After the configuration of the first purchase, customer data has to be transferred into one data base to allow their efficient use for re-orders.

4. Possible scenarios for a multi-channel customer interaction platform

A multi-channel sales strategy is often recommended to address the different preferences of diverse customer groups in regard to shopping behavior, online literacy, time sensitivity or product knowledge and thus

increasing customer loyalty and satisfaction (e.g. [33]). The main characteristics of such a multi-channel interaction platform is that the mass customizer offers different ways and possibilities for interaction and configuration, e.g. in a shop, on a website, via telephone. The customers decide which channel they want to use according to individual preferences, e.g. product or configuration experiences. This decision is influenced by the characteristics of the product being individualized, e.g. technical variety (customization possibilities) and customers' perceived complexity or the price of the good (compare for example the purchase of a watch with the purchase of a car). Another important point are customers' experiences with the customization process (e.g. product specific knowledge). The higher the perceived risk, the higher is the desire of a customer to interact with the supplier. Altogether, the following three scenarios can be distinguished:

(1) Pure offline interaction (first order and all re-orders offline): Customers choosing sheer offline configuration perhaps prefer the direct interaction with and support of a sales clerk during the configuration process. Even if they gain some experience in the field during the first configuration they return into the shop for further purchases. Perhaps they are suspicious buying via the internet or they enjoy the shop atmosphere; perhaps they want or need further assistance. Especially for relatively complex (from the customer's point of view) products, for example the customization of shoes regarding to fit, functionality and design, or for expensive products, for example cleaning robots (See e.g. www.sfb582.de), a customer may not have the necessary know-how to define it corresponding to his desires on his own. An intensive interaction is also needed from the seller's point of view in order to create confidence and to minimize the purchase risk.

(2) Mixed strategy (combined online and offline orders): Mostly within mixed strategies, the first order is an offline one, while the customer decides to re-order online. Reasons for this behavior could be that the customer needs more assistance of the sales clerk during the first configuration, e.g. because of lacking knowledge with configuration in general or with the configuration tool in particular. However, because of gained experience, efficient re-order via internet is preferred by the customer. Another explanation for this strategy could be that there is an intensive interaction with the customer necessary during the first configuration, but not for the following configurations because the company can use the customer data of the first interaction for all further purchases.

(3) Pure online interaction (first order and all re-orders online): Customers choose this way, e.g. due to an

internet affinity, a large physical distance to the shop, time insufficiencies or special intimacy wishes. New internet technologies offer plenty of possibilities, e.g. 3D-pictures or virtual models. Software tools like recommendation engines simplify the identification of preferences by recording, comparing, and aggregating former sales, pages views or click rates. They enable the direct presentation of individualized content and offer a first suggestion of a configuration by comparing user profiles and indices of content – even if a user cannot explicitly express his preferences and wishes ([34]; [35]).

Findings within the project EuroShoe (see www.euroshoe.net) support our approach ([32]): A survey within the project showed that consumers consider perfect fit and comfort as the major parameters in a customization concept for footwear. They are “must haves” in order to provide a significant higher added value in the eyes of the customers. In contrary fashion or design customization is not a major issue, neither for men nor for women. This means that very often an offline interaction possibility will be necessary in order to offer the “must haves” fit and comfort in an adequate way. Especially for the first order pure online-interaction often can't fulfill these customer needs. Furthermore, consumers seem to be deeply rooted in the retail based way of shopping for shoes. They expect competent advice and consulting, especially when shoes have several options for customization. Standard models of shoes in a broad variety are needed, too, even in a customization approach, as touch and feel is vital when buying fit-critical-products like shoes. The internet is rejected by almost 90% of consumers as a primary sales channel for standard shoes. However, 29% of women and even 46% of men would be interested in buying customized shoes online. This supports our approach, too. The internet may gain a growing importance in the case of re-orders and repeat purchases, but not as a means of interaction and transaction for the majority of customers.

5. A research project on customer interaction in multi-channel environments

While we have sketched briefly in the previous sections why pure online configuration systems often are not sufficient for mass customization, very limited research exists how to design and build a stable multi-channel interaction system. There is plenty of research on the design of retail stores, shop layouts and retailing environments, there is practically no comparable (user directed) research on the design of mass customization interaction platforms. The transfer of studies of websites for online selling to the online part of the mass

customization interaction platform is difficult as traditional online shops are much more related to print catalogs than to a modern system for customer interaction in a mass customization environment. In conclusion we state along with similar findings in the literature ([22]; [36]) that there is an immense gap between the canonical importance of customer interaction platforms for mass customization and the state of the art regarding the empirical findings as the base for a lasting implementation of appropriate systems.

A research project by the authors tries to investigate some of the foremost questions in an empirical setting. The knowledge that will be generated in this project shall help to design and implement better fitting co-design interfaces according to a specific company situation and configuration task. The field of research is the customer base of a real mass customizer, the Munich, Germany, based MC pioneer Selve AG. This firm provides customized women's shoes. Customization options of this firm are various: choice of colors and shades for uppers, lining and soles for the selected shoe model, choice of the heel and other design options, and a personal foot measurement. Selve offers all three interaction scenarios as described in the last section: Self measurement and co-design via the internet, accompanied by the possibility to try on sample shoes, which are sent via mail; as well as measurement by the help of a scanner and co-design on a kiosk system in the store. The offline configuration possibility in the shop is preferred by over 90% of Selve's customers in the moment for first sale. Customers enjoy the luxury and relaxing atmosphere of the shop, the support of the sales assistant and especially the possibility to touch the shoes, feel the leather and try on a lot of different sample shoes and models. However, a growing number of customers submit re-orders on the internet. This supports our recommendation of a multi-channel platform.

We will use the interaction systems of Selve to explore the following research topics and questions:

1. *Process pattern of user interaction: how do users interact in an online and offline environment?*

Despite of the fact that the configuration platform takes the role of the central interface between the mass customizer and the customer, it seems that there is only little knowledge about user interaction patterns in an online environment and even much less knowledge about their acting within offline interaction. We have to gain answers to questions such as

- Do users follow specific patterns while interacting in a mass customization shop or on a

mass customization website? Are there differences between offline and online interaction?

- Do individual users have distinct "styles" and needs when using interaction systems? Is there a need for more support when using offline configuration, for example?
- Which channels are preferred in which situations or from which kind of customer? Are there differences due to the kind of product offered?
- How many variants are explored and changed before making a final decision? Are there differences between the online and the offline environment?

2. *Reception of complexity: does "mass confusion" exist when interacting with customers offline and online?*

While mass customization is often addressed in the literature as a promising and beneficial approach to meet today's market demands, some authors have recently discussed its limits and concerns (e.g., [37]; [21]). One limit of mass customization often quoted is that excess variety may result in an external complexity that Pine termed as "mass confusion" (in: [38]). Customers can be overwhelmed by the number of choices during product configuration ([10]; [39]). Large assortments and choice are often supposed to be perceived as negative by consumers. Instead of offering possibilities and choice, they seem monumental and frustrating. To conclude, we have to state that there is almost no empirical insight on how customers actually respond to the complexity created by mass customization, especially in an offline environment. Hence, we have to gain answers to questions such as

- What is an appropriate number of choices within an online and offline environment from the user's perspective? Are there differences between online and offline interaction?
- Do different process designs and interaction platforms make it possible to handle different degrees of variety from the user's perception?
- Is it possible to reduce complexity from the customer's point of view when providing assistance of a sales clerk and a real shopping experience?
- To what extent is the role of a more active designer rather than a more passive chooser desirable?

3. *User satisfaction: what drives user satisfaction concerning the interaction platform?*

Both of the preceding research issues lead to the same question: how satisfied are users of mass customization platforms and what are the drivers of their satisfaction? The importance of this question is evident. Supposedly, only users who have a particular minimum level of satisfaction with the platform will finalize the design process and purchase the product, recommend the site to their acquaintances, and come back themselves – always assuming that the satisfaction with the product designed is sufficiently high. Research in customer satisfaction confirms the importance of this construct ([40]). It also seems conceivable that the satisfaction with the process has a large impact upon the satisfaction with the product in mass customization ([26]). First, it has been shown that the perception of product quality and that of a retail outlet are closely related ([41], [42]). In a mass customization system, the store is replaced by the interaction platform. Secondly, and even more important is the fact that in mass customization the individual product is the direct result of the process. A mass customizer is offering a solution capability, not a product. A felicitous and successful process will therefore have an impact on both process and product satisfaction. We hypothesize, that also personal characteristics such as creativity, innovativeness, need for individuality have an impact upon the experience of flow and user satisfaction with the configuration system. Future projects should tackle questions such as

- Which factors cause user satisfaction with the interaction platform for mass customization? Are there differences between pure online systems, pure offline systems and multi-channel interaction systems?
- Can suppliers achieve a higher average user satisfaction by offering a multi-channel interaction platform?
- What is the interrelation between process and product satisfaction? Is it influenced by the channel approach?
- Which user characteristics and usability characteristics of the interaction platform cause satisfaction differences?

4. *Value of individualization: Does mass customization pay?*

For users, the decision to buy individualized products is basically the result of a simple economic equation: if the (expected) returns exceed the (expected) costs the likelihood that he employs mass customization will

increase. Costs are, for example, the price of the product (respectively the price premium if the individualized product has a higher price than a standard offering) and the drawbacks of the user's integration into value creation during the configuration process we discussed earlier (such as risk, information overload, time and effort required, demand for trust, delivery time etc.). Returns are twofold: firstly possible rewards from the design process such as flow experience or satisfaction with the fulfillment of a co-design task, and secondly the value of customization, i.e. the increment of utility a customer gains from a product that fits better to his needs than the best standard product attainable ([43]; [44]). As the latter might be more enduring, this points to the utmost significance of the value of individualization. Only if users value this increment of utility highly enough, they are likely to design their own products via mass customization interaction platforms and may be willing to pay a price premium. In conclusion, we state that research on the economic value of getting an individualized product or service is an issue of vital importance. Thus, research is needed to cover questions such as

- How highly do customers value individualization? Which factors have an impact on this valuation?
- How does the kind of interaction system influence this value of individualization? Are there differences between different interaction systems?
- How far are these findings impacted by different user types?

To answer at least some of these questions within our research setting, we follow a four-step empirical research process including the following instruments: (i) First, (potential) customers were monitored during their interaction with the Selve systems to win new knowledge about the process patterns of user interaction in an offline environment (shop) and an online environment (website). Altogether 233 customers were interviewed in this survey. In addition, customers using pure web-order were monitored regarding their navigation on the website. The results of both kinds of monitoring (online and offline) will be compared with each other to see differences in customers' behavior. (ii) As a second instrument, a survey among existing customers about their experiences with Selve was conducted. Its objective is to investigate customers' reception of complexity, user satisfaction and value of individualization from the customers' point of view. (iii) Furthermore, experiments with customers and focus groups are planned to explore and discuss selected aspects of the research questions. These instruments

should allow gaining deeper knowledge in some important points discovered during step (i) (monitoring of customers) and step (ii) (survey among customers). (iv) Interviews with experts and suppliers of mass customized products are planned for the beginning of October based on the results of the stages (i) and (ii).

In the moment of writing this paper, the empirical investigation of steps (i) and (ii) is finished, but no comprehensive results are yet available. Our pre-results let us conclude that consumers follow a six-step process when purchasing customized products, both online and offline (see figure 1): communication phase, exploring stage, configuration phase, waiting and delivery time, after-sales and re-buy phase. Most of the customers enjoy the atmosphere and personal advice in the shop and even use it for their re-orders. For them, the

interaction process and support of the sales person is as much important as the product they receive some weeks later. The whole shopping process develops to an extended experience. Most of Selve's customers prefer offline configuration to online configuration, saying they would miss the special service feeling online. In addition, first results show that customers use the website primarily to experiment with new ideas and to inform themselves about the new collection before entering the shop. Some customers use the internet for re-orders. This supports our thinking that, though there is a need for an online sales channel, most customers don't want to use it as main shopping channel. If these results are confirmed by the final evaluation of our data and re-evaluation in research steps (iii) and (iv), this would demand a new design of many IT-systems for customer interaction in mass customization settings!

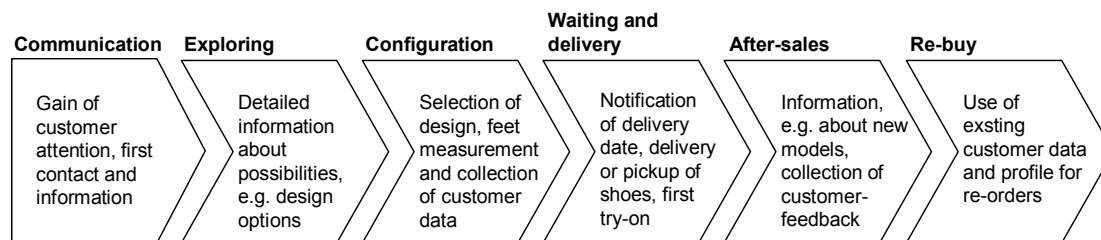


Figure 1: Six phases of customer interaction

6. Conclusion

This paper has explored some issues of mass customization research, which were not in the focus of previous research. Mass customization requires a process of co-design between each single customer and the supplier. Therefore, the interaction and configuration platform that enables users to design the desired product is crucial. The design and development of online configuration systems – which was in the focus of previous research – has to be supported by both – more knowledge on the integration of online configurators within multi-channel configuration systems and more knowledge on the behavior of consumers performing co-design tasks.

We will present more findings from the project introduced in this paper on the ISMC 04 workshop giving also indications on the support of the six phases identified in figure 1 from an IT-system perspective. The objective of this paper was to lay the ground for this research and to present the underlying issues. We regard these issues also as valuable without the exact data from our empirical research as the questions formulated above can help designers and developers of

customer interaction systems to identify some of the foremost demands and needs of such systems.

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