ENHANCING THE BLENDED SHOPPING CONCEPT WITH ADDITIVE MANUFACTURING TECHNOLOGIES

Added Value for Customers, Retailers and Additive Manufacturers

Britta Fuchs, Thomas Ritz and Henriette Stykow
Department of Electrical Engineering and Information Technology, FH Aachen, Eupener Str. 70, 52070 Aachen, Germany

Keywords: Blended Shopping, Mass Customization, Additive Manufacturing, eCommerce, Retail, Toolkit, Customer Experience, Distributed Manufacture.

Abstract: This paper starts from the idea that combining processes of eCommerce and traditional commerce (blended shopping) can bring advantages for customers and retailer. One possibility to take the emerged individualization trend on consumer markets into account is to integrate latest rapid prototyping technologies (additive manufacturing) in order to enhance the blended shopping concept. The availability of Internet can be seen as the enabler for such services. First blended shopping and rapid prototyping with its latest developments of additive manufacturing (AM) are explained. Then their impacts on the aimed individualized blended shopping concept are depicted with the help of a use case. From this use case the benefits for business and consumers are derived and additionally the framework of a needed AM-toolkit is concretized. Finally the paper closes with a future outlook on the necessity of research in the field of individualization aspects of blended shopping and web standards.

1 INTRODUCTION

Fundamental changes have occurred in the last years regarding the shopping behavior of consumers, who nowadays organize their purchase over different distribution channels.

The idea of blended shopping (Fuchs and Ritz, 2009) is to overcome the borders of traditional retail and eCommerce in order to deliver increased value to customer and merchant. Integrating eCommerce services into a brick-and-mortar-shop demands for interactive systems (such as web-enabled kiosk terminals or mobile devices). Internet is the enabler of blended shopping concepts, facilitates the shopping processes and drives customer experience. Customer experience is known to tremendously shape the overall shopping engagement of the individual.

Shopping as the goal-directed process of buying a product not only depends on the utilitarian value that is being proposed, but also on hedonic values. Buying customized products has a high impact on the hedonic value at usually high costs. A way to offer customized products at (almost) mass product prizes is mass customization (MC). It may now experience another raise of importance with the advent of additive manufacturing technologies (AM). These enable an extent of freedom of creation that was recently unknown and are mainly used by industry to produce prototypes or small batches. Now customized products produced by AM technology are ready to be offered to consumers as well.

To take the individualization trend into account this paper addresses the enhancement of the blended shopping concept by integrating latest customization possibilities (AM). The ideas of blended shopping and MC with AM are explained in chapter 2. The possibilities and challenges for customer, merchants and AM producers are presented in chapter 3. In this scenario data flows and processes have to be reengineered determined e.g. by the fact that non-specialists (customers) have to communicate with technicians (AM producers). A future outlook is given in chapter 4.

2 SHOPPING AND PRODUCTION APPROACHES

In this chapter the basic aspects of blended

Fuchs B., Ritz T. and Stykow H..
ENHANCING THE BLENDED SHOPPING CONCEPT WITH ADDITIVE MANUFACTURING TECHNOLOGIES - Added Value for Customers, Retailers and Additive Manufacturers.
DOI: 10.5220/0003933704920501
In *Proceedings of the 8th International Conference on Web Information Systems and Technologies* (WEBIST-2012), pages 492-501
ISBN: 978-989-8565-08-2

shopping, mass customization and additive manufacturing are explained. This introduces to the extension of the blended shopping concept with customization in chapter 3.

2.1 Blended Shopping

When making a purchase decision, customers pass several phases (see figure 1).

Figure 1: Customer decision process.

After recognizing a certain need or shortage of something, they start searching for solutions. The information mediation phase and the evaluation of its outcome are critical for the purchase decision regarding what product to buy and where (to what price) to buy it. The conditions under which a decision is taken also influence the perceived satisfaction during later usage. The internet has impacted shopping behaviors significantly. The growth of information technology and its ubiquity has strengthened the power of the customer. Not only does he have easy access to domain knowledge, price comparisons and user reviews on products but also the opportunity to influence the rise and fall of products and brands. Customers identified ways to combine advantages of the traditional retail channel with those of eCommerce: They might gather information online and buy the product in a brick-and-mortar-shop or vice versa, depending on the type of product (Grewal et al., 2009); (van Baal and Hudetz, 2008).

The concept of blended shopping expresses the combination of both traditional retail and eCommerce processes (Fuchs and Ritz, 2011). Integrating eCommerce facilities into a brick-and-mortar-shop could help the merchant to keep turnover within the trade chain by satisfying customers. Nevertheless many retailers still fear the power of information technologies. Implementations of interactive prototypes have depicted opportunities of how to take advantage on the retail environment (Fuchs and Ritz, 2011). Delivering information in a relevant context proved to enhance the way the customer navigates and understands the information. This idea is not new – self-service technologies like in-store information terminals or bar code scanners are common retail practice for years. They provide extensive product selections and powerful search tools. For online shops offering this exact benefit it becomes increasingly popular to gather the interaction data of the user (e.g. which products/features a customer was interested in, which topics he explored how long, etc.). The blended shopping scenario aims to gather that information within the retail channel, which makes its purposeful utilization more likely.

2.2 Customer Experience

The integration of interactive systems, such as terminals or mobile devices by its nature adds another aspect to the retail environment. Multimedia-driven experience is one effective means to shape a compelling customer experience and a presumption to deal with the integration of individualized products into the value chain.

Even though shopping is a purposeful activity, it is not only and sometimes not even the goal to acquire a product. Besides the specific need for a product (utilitarian motivation), the wish for social interaction, entertainment, recreation or intellectual stimulation (hedonic motivations) might encourage shopping (Arnold and Reynolds, 2003). These aspects comprise emotional and social values (Kotler et al., 2007); (Meffert and Burmann, 2008) that add to the utilitarian value (see figure 2). They impact the purchase decision.

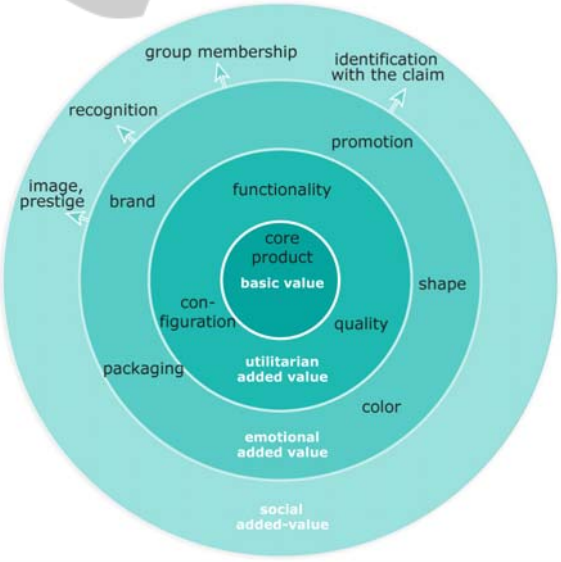

Figure 2: Overall value of a product.

Puccinelli et al. (2009) suggest that goals, schema, information processing, memory, involvement, attitudes, affect, atmospherics, consumer attributions and choices critically influence the shopping behavior.

While the influence from these elements differs according to the phase of the decision process, all of these are relevant for the evaluation phase. Understanding these influences on the customer is a precondition to enhance retail performance and thus increase customer satisfaction and loyalty. They impact the cognitive, affective, emotional, social and physical responses to the retailer (Verhoef et al., 2009). Despite the fact that he cannot control the bespoken aspects, there are further facts that add to the overall picture of a retail experience. These include e.g. shop atmosphere, store layout, assortment and prices. They all built up to what is called customer experience. It is defined as "the internal and subjective response customers have to any direct or indirect contact with a company. Direct contact generally occurs in the course of purchase, use, and service and is usually initiated by the customer. Indirect contact most often involves unplanned encounters with representatives of a company's products, service or brands and takes the form of word-of-mouth recommendations or criticisms, advertising, news reports, reviews and so forth" (Meyer and Schwager, 2007, p. 117).

Heading for a customer-oriented strategy, retailers have to actively enrich the customer experience by addressing the previously mentioned aspects. It was argued that this has to take place in accordance to the customer's needs and objectives. These critical retail drivers are so various because they are unique to every customer. Consequently, they are better understood the more a retailer knows about the individual. One way to approach this goal is to integrate the customer into retail experience or even value creation like extending blended shopping with individualization aspects.

2.3 Mass Customization

Blended shopping and the creation of customer experience have the customer-centric approach in common. It is that same idea that mass customization originated in. Coined in 1987 by Davis (Davis, 1987) and later refined by Pine (Pine, 1993) it means "developing, producing, marketing and delivering affordable goods and services with enough variety and customization that nearly everyone finds exactly what they want" (p.44).

Once meant to meet the requirements and needs of the individual customer MC until today did not gain the market share one, with good cause, would have it credited to. The idea of providing the customer with an individualized product or service that better suits his individual preferences than any standard product is a goal, which enjoys more right to exist than ever before.

Several facets lend themselves to distinguish types of mass customization (Duray et al., 2000); (Gilmore and Pine, 1997); (Piller and Stotko, 2002). The most basic delineation expresses who is in charge of transforming the customization information into a product specification. In this sense passive MC means that the transformation is executed by the operator, whereas active MC assigns this task to the customer.

The idea behind mass customization is basically highly emotional: By customizing a mass product the customer is caught at his most profound desires and needs which derive from his personality, life-style, self-perception and preferences. Blending these attributes into a standard mass product becomes more promising and at the same time challenging when this task is achieved by the customer itself (active MC). In the latter case, the customer finds himself in the position of a co-creator. He is ought to choose from a pre-defined set of parameters and alternatives. This co-creation-phase specifies the individual product.

The fact that preference information is known to be sticky, which means that it is difficult to be transferred from customer to supplier, militates in favor of this form of active mass customization. It is standard practice to enhance the information elicitation with an interactive system (so-called configurator or toolkit) (Piller, 2004).

2.4 Additive Manufacturing

The manufacturing industry for hundreds of years has applied formative (e.g. pottery) or subtractive (e.g. laser cutting) techniques in order to produce goods. Recently, additive manufacturing (AM), commonly known as 3D-printing, has evolved. It describes the arrangement of material layers that finally built up to the object. The geometrical information for each slice is being derived from a CAD volume-model. It defines the object's inner and outer shape. In order to build it, the model is virtually being sliced into fine layers. This contour information is given to the AM machine, which then generates the object (Gebhardt, 2004). The different AM technologies differ in terms of the way the layers are generated (gluing, melting, extruding), the materials they are able to process and the way the layers are connected. Either way, the physical and mechanical properties of the object are defined by the chosen material.

AM allows for a range of design possibilities that was unknown until today. Since the product is built up layer by layer, this allows for new approaches on the product design such as:

- definition of the inner structure (impacts e.g. weight and stability)
- complexity (e.g. holes, arching, warps, interweavement)
- integrated functional elements (e.g. hinges)
- parts consolidation (multiple elements may be manufactured as one)

Leaving behind traditional design restrictions in terms of undercuts, draft angles, weld lines, avoidance of sharp corners and uniform wall thickness considerations, this offers real design freedom (Hopkinson et al., 2006). However, some considerations on wall thickness and resolution (that is the height on the individual layers) and material are required. They depend on the chosen technology.

Today's variety of applications of AM shows its opportunities. Besides aerospace and industry branches like automotive it establishes on markets where highly individual products are needed. These include dental applications, hearing aids and prostheses. It is furthermore emerging in jewelry industry. With the coverage of further materials, AM will become more relevant for other industries as well (Gebhardt, 2007).

3 USE CASE: SHOE SOLE CUSTOMIZATION

The almost unconstrained design freedom favors additive manufacturing for mass customization with blended shopping. It even pushes the boundaries of what MC is known today. While existing MC-approaches mostly offer the configuration of pre-defined parameter values, MC with AM permits an unconstrained solution space. This lives up to what customization is meant to be.

This chapter ponders that potential application in the field of shoe customization in a traditional brick-and-mortar shop: the customization of the outsole of a shoe. It demonstrates the benefits for potential parties involved. Main facets grow from the creation of a customer experience.

3.1 Concept Legitimation

The authors developed a concept for the customization of the outsole of a shoe. AM allows to not only modify the design in terms of color or materials. The customer can create his very personal footprint by also designing the patterns of the outsole. Additionally it allows adding functional elements such as spikes or heels. This customization is enabled through a kiosk-system that runs the product-specific application (toolkit).

Researchers and suppliers have identified the footwear segment as a suitable use case for offering individualization services. NikeID, Adidias Mi, and Selve just name a few of available offerings today. Apart from design choices, research has also addressed how to automate production processes to individualize the fit of a shoe. Proofs of concept have already been achieved for the use of additive manufacturing (Dietrich et al., 2007); (Peels, 2010).

The cross-channel behavior of consumers in the footwear market shows, that 50% of the purchases that are fulfilled via online sales happened to have started in the traditional retail (van Baal and Hudetz, 2008). This makes it an ideal field for applying blended shopping strategies. Innovating the retails' purchase offers is a good means of differentiating from competitors as shoe merchants are noticeable conservative (Theis, 2006). The intention to offer MC-service for a retailer might be to enhance his service and performance in order to offer benefit to the customer. By that, he could increase loyalty and retention and create a new image to differentiate from competition.

3.2 Business Benefits

The retail ties in basic value creation activities of other parties – namely the manufacturer of the shoe, the additive manufacturing provider and the customer. The individual benefits of these actors depend on the chosen operator model. It also impacts questions on copyright and data ownership.

Figure 3: Values for involved parties.

The shoe manufacturer gives the shoes to the retailer. Ideally and due to the fact that a sole has to be assembled to the shoe, these shoes leave the manufacturers facilities before the native sole is attached. The additive manufacturers would let the retailer rent AM annexes, so that they could be placed inside the store for attraction purposes. The customer invests time, effort and money and leaves interaction data as well as a certain amount of personal data (e.g. address, name). The retail in return delivers value to these parties (see figure 3).

The manufacturer will profit essentially from the integration of the customer. It could be particularly interesting to recognize, what the customers use the shoe for. As the ability of the customer to directly manipulate a product that once a huge brand and manufacturer was in charge of, this integration means a shift to democratizing the way products are created. The manufacturer would have a stake in this as this provides an immediate access to customer needs and innovation ideas. He could react on this with changes on his assortment. Moreover such an approach offers valuable differentiation aspects from competition.

The scenario opens a new market for the additive manufacturer. It also benefits from the predictability of the production needs. As he is mainly involved in industrial projects, where requirements differ hourly, this makes a difference: after initial requirements engineering it will become a routine and a self-up-keeping source of revenue. Entering new markets and addressing new target groups means as well a growing independence of AM producers from large scale industry.

The retail itself gains insights into evolving needs and trends of its customers. This could be transformed into better marketing and advice but should also be used to improve the creation of a compelling customer experience.

3.3 Customer Benefits

The benefits for the customer are twofold. Merle et al. (2010) allocate the values from the customer perspective to co-design on the one side and product value on the other (compare table 1). While utilitarian, uniqueness and self-expressiveness value are defined as product-related, hedonic and creative achievement value are assigned to the co-creation-process. Following it will be argued that all values are determined in both co-creation and product experience.

Utilitarian value is related to the product's fit to individual requirements (Dellaert and Dabholkar, 2009). It rises when the customized product provides higher values than any standard product (Tseng and Jiao, 2001). This is achieved through the fit of style, function and physical fit (Piller, 2004). Moreover, the co-creation itself increases the utilitarian benefit. As the customer has to explore the solution space, he dives deeper into the subject. Not only does this convey information on the domain (of shoes and potential key value attributes) but also does it stimulate reflections on his needs. This facilitates the customization decisions.

Apart from that, psychological effects need to be considered. They consist in the symbolic meaning of the products uniqueness. Autonomy and uniqueness rise from the range of the solution space. Studies of Sinclair and Campbell (2009) revealed that customers doubt that no other would have made the exact changes to a pre-existing model that they carried out. For the design for AM, the uniqueness value is highly increased due to the freedom of creation.

Self-expression may be considered a life goal, so to say a long-term desire and motivation that justifies the end goal. Co-creation targets the self-fulfillment and the creative engagement. Self-expression describes also how the customer wants to feel during the co-creation and may therefore be considered as an experience goal. It mainly causes that the customer perceives an increased quality of the product after customization (Füller et al., 2011). Competency, task and process enjoyment mainly shape these emotions. The self-expressiveness value of the final product helps the customer to differentiate from other consumers. It is proposed that this is motivated from counter-conformity attempts (Tian et al., 2001). Creating value with solutions for own needs and requirements increases this self-congruity which results in higher satisfaction. At the same time, customers tend to choose products which reflect their self-perception (status, taste, style) (Chang et al., 2009); (Chang and Chen, 2009).

Emotions and mood impair the satisfaction essentially (Jones, Reynolds, & Arnold, 2006). The co-creation experience has a high impact on the perceived value of the product and the underlying end goals. The hedonic values are correlated with the customer satisfaction with the product. Additional value rises with the recognition and admiration when the customized product is shown to peers.

The creative achievement value may be perceived as the fulfillment of a life goal. It is related to the efforts the customer had to take. This perception is influenced by both store and design

Table 1: Perceived benefits for the customer during and after customization process.

	Co-creation	Product usage
utilitarian value	explore options, reflect on own requirements and needs, understand domain-related correlations	aesthetic, functional fit, congruency
uniqueness value	motivator to take the efforts, depends on the variety of options	better fit to personal unique situations than any standard product
self-expressiveness value	as an innovator, creator, designer (life goals)	reflects attitude and self-perception
hedonic value	entertainment, quality time, enjoyment, fun	more pleasant to use, recognition and admiration of peers
creative achievement value	accomplishment of creative task, supported by small rewards along the way	pride-of-authorship

of the customization process (e.g. supported by interactive media). Customers will be proud, if the efforts are rewarded with surprisingly good outcomes (Franke et al., 2008; Weiner, 1985). Pride-of-authorship nurtures satisfaction with the product. This affects the way the customer uses the product, the feelings that are connected with it and the way he presents it to others. These feelings are well suited for positive-word-of-mouth advertising and for viral marketing attempts.

3.4 Solution Space Development

In order to provide the biggest benefit for the customer, the customization operator must identify the key value attributes that on the one hand influence the buying behavior and on the other reflect in which the target group differs the most. In the use case of this paper we assume that customers base their purchase decisions on sole features including e.g. style, impermeability, resistance to slippage, flexibility, foot protection, breathability. Six attributes sum up these requirements: color, material, shape, inner structure of the sole, tread and method of attaching the sole to the shoe.

The presented scenario focuses on offering color, material, shape and tread as customizable features, leaving behind those attributes that would not considerably increase the perceived value for the customer. These four dimensions cover modification of quality, size, look, functionality and contribute to additional service propositions such as unique packaging and gimmicks. Thus it comprises all kinds of values, which a product bundles.

3.5 Toolkit Development

3.5.1 Need for an AM-Toolkit

Pushing the boundaries of MC with AM, on the first sight this sounds like a great achievement. The challenge behind is to on the one side make the solution space accessible for the customer and on the other make sure that the design freedom would not overwhelm the him.

If unconstrained freedom shall be given to the co-creation, how can the customer make use of it? It has to be considered that he might lack in professional skills of designing his product. Or even earlier in the process, he might not even feel inspired or creative enough to approach such a design task.

An interactive system, the toolkit, comes in handy at that point. It acts on the interface between customer and production. It enables the customer to transform wishes and ideas into certain product specifications or design (see figure 4). That is, he reaches his end-goal of customizing the shoe. In the peculiar context of AM, the toolkit would need to:

- make the solution space accessible
- provide easy to use design tools
- inspire and entertain, in order to lower the perceived effort for the customer
- consider manufacturing issues (that is unstick the supplier's information for the customer)
- organize the data-exchange with the AM machine
- enable the customer to fulfill the co-creation by ordering the manufacture of his product.

The toolkit must communicate its potential for co-creation. This effect has to take place in the need recognition phase in order to stimulate the customer's desire for self-expression. The overall intention must be communicated, the way of interaction must attract people and potential achievements must be presented since it may occur that the customer does not foresee the concrete outcome of his creation.

Generally, the customer will tackle the customization with high involvement due to the fact that he wants to realize his needs and ideas in order to acquire a better fit than the available standard product. As long as the toolkit does not deceive him,

he will be willing to invest time, engagement and money. Research should collect data on where this acceptance reaches its limits.

Moreover, the toolkit ties in the data of all parties involved. This requires an integration of enterprise specific applications, e.g. ERP- and CRM-systems. The integration of social web and communities can raise additional value. Depending on the product category and the customization aim it could also help to connect the toolkit to online databases of 3D-models available for download.

Figure 4: Main responsibilities of the toolkit.

3.5.2 Implications on Interface Design

The interface design of the toolkit is a decisive criterion for success. It essentially shapes the experience. Its relevance for the creation of benefits for the customer has been shown. This does account for business goals as well: If the entertainment and challenge by the co-creation-task are taken in positively, even customers' willingness to pay higher prizes increases (Franke and Schreier, 2010); (Merle et al., 2010). The modern interaction design theory pays immense attention to the requirements of users, users' tasks and context of use.

Offering the co-creation as active MC has to deal with the fact that the customer might lack in design-related skills. Customers that engage in MC activities have daily contact with web browsing, e-mail, social networking, social messaging services, Microsoft Office software as well as other applications (Bauer, 2010); (Füller et al., 2011). Even though that favors the technology readiness of the customers, they still might perceive the efforts as high transaction costs. Employees in the store can eliminate that by supporting the customer. Nonetheless, the system has to provide the customer with design opportunities and ensure the manufacturability.

Engaging AM as the production method predetermines that a 3D-modell has to come out of the design process. To enable the customer to make use of the design freedom, intuitive interaction approaches (e.g. using a touch screen) that facilitate the design activities and support metaphors (e.g. of formative manufacturing as it is known by the customer) have to be considered. Engaging pleasant and suitable metaphors and topics help to focus the attention of the customer. Additionally they help rise positive associations and positive feelings. Ideally this leads to a linkage of compelling experiences with the brand or store.

Furthermore, locating the toolkit in the retail environment implies that noise, rush and light might negatively impair the process and rob the customer's attention.

3.5.3 Permit Customization Actions

It is of major importance to guide the user through specific customization possibilities, to inspire and encourage him to pursue the process and to support his design.

Concrete actions may stimulate the customer's involvement. Promotion, campaigns and claims should seek to address the life goals of the customer and emphasize the experience, which the customization leverages. The issued appeals could target the expression of personality, self-confidence or even environmental consciousness (e.g. the AM technology is power-saving compared to the standard production). The decision in favor of any of the proposed means must be based on the customer's attitudes and goals.

Employees, signage and toolkit have to introduce the customer to the domain of customization and present the solution space. It is important to overcome doubts. In the given case, this means primarily showing examples of customizations by other clients. Related to that, an introduction to AM would come in handy. As this technology is probably not well known to the customer, it is accompanied by a certain fascination and awakes his curiosity. Even if this presentation does not lead into co-creation, it will have stimulated that the customer talks about it. Retail has the means to make the customer experience the customization dimensions, for example by touching material samples, testing a customized sole or watching the production process in a show-annex.

In order to lock-in the customer for the co-creation phase, the toolkit has to engage the customer to become creative. If his intrinsic motivation already does so, the toolkit at least has to keep him motivated. That is why the interaction with

the toolkit has to be easy. Ideally it is easier than the customer would have thought after seeing the customizations of others. Such a surprise could finally convince the customer to try it out.

3.5.4 Choice Navigation

The toolkit needs to provide guidance to the customer when navigating through the solution space. This can be achieved by structuring the process meaningful and conveying information about the domain (e.g. with the help of third parties). Necessary information must be delivered wisely in the correct context. It could ask for need-oriented potential use cases of the shoe (such as sports, business, clubbing) in order to transform the technical specifications into a decision aid that is compatible with the users' mind setting, language and mental model.

The operation on the system should be supported by well-chosen interaction patterns. The toolkit can take advantage of the retailing context in order to facilitate and enhance the co-creation process for the customer. Enabled through e.g. RFID-technology, physical interaction with a shoe could be tracked. Thanks to this information the toolkit would know about the shoe model and the chosen size. A similar technique could support choice of materials and colors. Especially in the unknown area of AM, touching material and surface samples provides a compelling experience.

One could call this some kind of a push-and-pull-discourse of customer and terminal-system. The display of information reacts on the customer's testing of the product and samples. Descriptions can help him discover his own preferences and compare it to the opportunities provided in the solution space. This prepares the ground for his purchase decisions.

So far this applies mainly to rational choices, such as deciding on a material with cushioning effect. The emotional choice when it comes to design with shapes or text insets is more difficult to direct. Sinclair and Campbell (2009) studied whether participants would prefer sketching or 3d-modelling. It turned out they preferred to manipulate parameters of a 3d-object over sketching, even though they found their design intent better communicated in the own sketch. Many existing toolkits provide poor visualizations. One flaw is the inaccuracy of the representation which partly doesn't even adapt to the changes that the customer makes. On the one hand, AM as method of production already suggests a 3D-visualization of the object of interest. It may nonetheless not be a good basis for customization interactions. Research should focus on this topic.

Continuative approaches of letting users manipulate 3D-models with touch interaction are known from the iPad App 123D Sculpt (Autodesk). The proposed interaction on rubbing on models surface via a touch screen is convincing from an interaction designer's point of view. Unfortunately there is no data available on the acceptance of that interaction paradigm. It seems promising to enhance these interaction patterns with real interactions.

The case of outsole customization offers one major benefit: for a major part, the customization can take place in 2d-space. The flat design can later be extruded into the third dimension. In this way, images could be drawn on screens to later be extruded. They could also be integrated into the modeling-process as a height map. Drawings and pictures could give texture to the models - photos could be taken right away at the terminal.

The integration of social networks could deliver additional benefit. Examples could be:

- allowing users to post different designs online in order to get feedback from peers (value through peer recognition)
- establish an online community where lead users could answer questions of novice users (reputation in the community)
- allow voting and commenting on best designs and user-galleries (online dwell times)
- collect additional data about preferences, interest, personal data (usable for collaborative filtering and reasoning about correlations)

4 CONCLUSIONS AND FUTURE RESEARCH

Within this paper it was explained that additive manufacturing (AM) shows potential to be an extension of the blended shopping concept. Until now, this is not commercially implemented. The advantages of the customized blended shopping concept were described. Merchants and AM producer will only be able to organize and offer such consumer added value via web platforms. The chosen shoe sole use case addresses a scenario where the customized product is an integral part of a mass product. This causes besides others logistic, legal and management problems.

Producing individualized accessories as independent parts of mass products would overcome e.g. assembling problems but would give mass

products an individual look. This can be viewed as an extended value chain of mass products.

Nevertheless process and data standards need to be adopted or developed in order to be able to offer an individualization space limited by the fitting mass product and production restrictions, to enable customers to easily configure an accessory and to hand over the data to production. Underlying logistic and management processes need to be adopted. Further considerations need to be drawn on potential operator models and their implications. Finally a demonstrator making use of latest internet technology is needed to visualize the possibilities and advantages of such a concept.

These research gaps will be subject of a research project funded by the German Ministry of Economics and Technology (BMWI).

REFERENCES

Arnold, M. J., and Reynolds, K. E. (2003). Hedonic shopping motivations. *Journal of Retailing*, *79*(2), 77–95.

Bauer, H. H. (2010). Typology of Potential Benefits of Mass Customization Offerings for Customers: An Exploratory Study of the Customer Perspective. In F. T. Piller & M. M. Tseng (Eds.), *Handbook of research in mass customization and personalization.* New Jersey: World Scientific.

Chang, C.-C., and Chen, H.-Y. (2009). I want products my own way, but which way? The effects of different product categories and cues on customer responses to Web-based customizations. *Cyberpsychology & Behavior*, *12*(1), 7–14.

Chang, C.-C., Chen, H.-Y., and Huang, I.-C. (2009). The interplay between customer participation and difficulty of design examples in the online designing process and its effect on customer satisfaction: mediational analyses. *Cyberpsychology & Behavior*, *12*(2), 147–154.

Davis, S. M. (1987). *Future perfect*. Reading, Mass: Addison-Wesley.

Dellaert, B. G. C., and Dabholkar, P. A. (2009). Increasing the Attractiveness of Mass Customization: The Role of Complementary On-line Services and Range of Options. *International Journal of Electronic Commerce*, *13*(3), 43–70.

Dietrich, A. J., Kirn, S., and Sugumaran, V. (2007). A Service-Oriented Architecture for Mass Customization—A Shoe Industry Case Study. *Engineering Management*, *54*(1), 190–204.

Duray, R., Ward, P. T., Milligan, G. W., and Berry, W. L. (2000). Approaches to mass customization: configurations and empirical validation. *Journal of Operations Management*, *18*(6), 605–625.

Franke, N., and Schreier, M. (2010). Why Customers Value Mass-customized Products: The Importance of Process Effort and Enjoyment. *Journal of Product Innovation Management*, *27*(7), 1020□1031.

Franke, N., Keinz, P., and Schreier, M. (2008). Complementing Mass Customization Toolkits with User Communities: How Peer Input Improves Customer Self-Design. *Journal of Product Innovation Management*, *25*(6), 546□559.

Fuchs, B., and Ritz, T. (2009). Blended Shopping. In M. Bick, M. Breunig, & H. Höpfner (Eds.), *Mobile und Ubiquitäre Informationssysteme. Entwicklung, Implementierung und Anwendung. Proceedings zur 4. Konferenz MMS 2009* (Vol. 2009, pp. 109–122).

Fuchs, B., and Ritz, T. (2011). Blended Shopping: Interactivity and Individualization. In ICETE 2011 (Ed.), *8th International Joint Conference on e-Business and Telecommunications* .

Füller, J., Hutter, K., and Faullant, R. (2011). Why co-creation experience matters? Creative experience and its impact on the quantity and quality of creative contributions. *R&D Management*, *41*(3), 259–273.

Gebhardt, A. (2004). Grundlagen des Rapid Prototyping.: Eine Kurzdarstellung der Rapid Prototyping Verfahren. *RTejournal*, *1*(1).

Gebhardt, A. (2007). *Generative Fertigungsverfahren: Rapid Prototyping - Rapid Tooling - Rapid Manufacturing* (3rd ed.). München: Hanser.

Gilmore, J. H., and Pine, B. J. (1997). The four faces of mass customization. *Harvard Business Review*, *75*(1), 91–101.

Grewal, D., Levy, M., and Kumar, V. (2009). Customer Experience Management in Retailing: An Organizing Framework. *Journal of Retailing*, *85*(1), 1–14.

Hopkinson, N., Hague, R. J. M., and Dickens, P. M. (2006). *Rapid manufacturing: An industrial revolution for the digital age*. Chichester, England: John Wiley.

Jones, M. A., Reynolds, K. E., and Arnold, M. J. (2006). Hedonic and utilitarian shopping value: Investigating differential effects on retail outcomes. *Journal of Business Research*, *59*(9), 974–981.

Kotler, P., Keller, K. L. and Bliemel, F. (2007). *Marketing-Management: Strategien für wertschaffendes Handeln* (12th ed.). München: Pearson Studium.

Meffert, H., and Burmann, C. (2008). *Marketing: Grundlagen marktorientierter Unternehmensführung ; Konzepte - Instrumente - Praxisbeispiele* (10th ed.). Wiesbaden: Gabler.

Merle, A., Chandon, J.-L., Roux, E., and Alizon, F. (2010). Perceived Value of the Mass-Customized Product and Mass Customization Experience for Individual Consumers. *Production and Operations Management*, *19*(5), 503-514.

Meyer, C., and Schwager, A. (2007). Understanding Customer Experience. *Harvard Business Review*, *85*(2), 116–126.

Peels, J. (2010). *Eleven 3D Printing Predictions For the Year 2011.* Retrieved Aug 13, 2011, from

http://techcrunch.com/2010/12/31/3d-printing-prediction/

Piller, F. T. (2004). Mass Customization: Reflections on the State of the Concept. *International Journal of Flexible Manufacturing Systems*, *16*, 313–334.

Piller, F. T., and Stotko, C. (Eds.) 2002. *Mass customization: four approaches to deliver customized products and services with mass production efficiency*. : Vol. *2*.

Pine, B. J. (1993). *Mass Customization: The New Frontier in Business Competition*. Boston, MA: Harvard Business School.

Theis, H.-J. (2006). *Erfolgreiche Strategien und Instrumente im E-Commerce* (Vol. 2). Frankfurt am Main: Dt. Fachverl.

Tian, K. T., Bearden, W. O., and Hunter, G. L. (2001). Consumers' Need for Uniqueness: Scale Development and Validation. *Journal of Consumer Research*, *28*(1), 50–66.

Tseng, M. M., and Jiao, J. (2001). Mass Customization. In G. Salvendy (Ed.), *Handbook of industrial engineering. Technology and operations management* (3rd ed., pp. 684–709). New York: Wiley.

van Baal, S., and Hudetz, K. (2008). *Das Multi-Channel-Verhalten der Konsumenten: Ergebnisse einer empirischen Untersuchung zum Informations- und Kaufverhalten in Mehrkanalsystemen des Handels*. Köln: IfH.

Verhoef, P. C., Lemon, K. N., Parasuraman, A., Roggeveen, A., Tsiros, M., and Schlesinger, L. A. (2009). Customer Experience Creation: Determinants, Dynamics and Management Strategies. *Journal of Retailing*, *85*(1), 31–41.

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review*, *92*(4), 548–573.