



Co-designing modes of cooperation at the customer interface: learning from exploratory research

Christoph Berger¹, Kathrin Möslin², Frank Piller^{3,4}, Ralf Reichwald⁵

¹Adidas-Salomon AG, Herzogenaurach, Germany;

²Advanced Institute of Management Research (AIM), London Business School, London, UK;

³MIT Sloan School of Management, Cambridge, MA, USA;

⁴TUM Business School, Munich, Germany;

⁵TUM Business School, Institute for Information, Organisation & Management, Munich, Germany

Correspondence: K Möslin and F Piller, TUM Business School, Leopoldstrasse 139, 80804 Munich, Germany.

Tel: +44 870 734 3000

Fax: +44 870 734 3001

E-mail: kmoeslein@london.edu, piller@mit.edu

Published online: ●●●●

Abstract

The objective of this paper is to explore new modes of cooperation among customers, retailers and manufacturers resulting from co-design – a customer-centric business strategy. Co-design activities are performed at dedicated interfaces and allow for the joint development of products and solutions between individual customers and manufacturers. Our research on co-design is based on a deep interaction with case companies, making the research itself a further collaborative effort. In this paper, we first explore collaboration challenges with a case company introducing customer co-design (*Adidas-Salomon AG*, a sport goods manufacturer). In a second step of exploration, we use findings from a larger database of case studies on customer co-design or mass customization to identify four basic modes of cooperation between customers, retailers and manufacturers. In a final step, the understanding gained from this differentiation is refined using the Adidas case. From the perspective of management practice, our research contributes to a better understanding of the collaboration challenges following a customer-centric business strategy. From the perspective of management research, the paper provides both a conceptual model of cooperation demands at the customer interface and a methodological framework for collaborative management research between academics and companies.

European Management Review (2005) 0, 000–000. doi:10.1057/palgrave.emr.1500030

Keywords: customer-centric strategy; co-design; mass customization; modes of cooperation; absorptive capacity; action research

Cooperation in customer-centric strategies

‘The mass market is dead,’ Kotler (1989, 47) provocatively said when describing the evolution from mass markets to niche markets that finally led to strategies that address customers individually. Kotler as well as many other scholars have been pleading for a perspective that gives priority to the building up and maintenance of long-term profitable relationships with promising individual customers, as opposed to the short-term success-orientated approach of single transactions in anonymous mass markets (Day, 1994; Sheth *et al.*, 2000). The ultimate form of this kind of customer centricity is to

provide customized products or services that meet the desires and wishes of each individual customer exactly (Milgrom and Roberts, 1990).

Customer co-design or mass customization, which will be the focus of our paper, is a particularly promising way of serving individual customers both individually and efficiently. The objective of mass customization is to deliver goods and services that meet individual customers’ needs with near mass production efficiency (Pine, 1993; Tseng and Jiao, 2001; Piller, 2005). This means that individualized or personalized goods will be provided without the high cost (and, thus, price premiums) usually connected with

(craft) customization. This is possible due to the capabilities of modern manufacturing technology, including flexible manufacturing systems and modular product structures, both of which reduce the trade-off between variety and productivity (Pine, 1993; Kotha, 1995; Victor and Boynton, 1998; Ahlström and Westbrook, 1999; Agrawal *et al.*, 2001). Companies are therefore able to embrace both cost efficiency and a much closer reaction to customers' needs. New flexible manufacturing systems, however, are a necessary but not sufficient condition for successful customer-centric strategies. They have to be supplemented by infrastructures capable of handling the interaction and cooperation demands resulting from customer co-design (Huffman and Kahn, 1998; Lee *et al.*, 2000; Reichwald *et al.*, 2000; Zipkin, 2001). Every transaction in a co-design system implies information and coordination about the customer-specific product design. The manufacturer has to interact with the customer to obtain specific information that defines and translates the customers' needs and desires into a concrete product specification. In other words, the product is the result of a cooperation ('co-creation', Wikström, 1996b; Ramirez, 1999) between each single customer and the manufacturer, not only providing benefits, but also demanding input from both sides. This co-design process implies a new form of cooperation. The result is a system of company-customer interaction (social exchange) and adaptation for the purpose of attaining added value (Milgrom and Roberts, 1990; Normann and Ramirez, 1993).

An important task for firms heading towards customer centricity is to develop and operate new kinds of customer interfaces and customer interaction systems. Cooperation requires building an efficient platform (Thomke and von Hippel, 2002; Franke and Piller, 2003). In many cases, however, not only do the manufacturer and the customer have to collaborate, but manufacturers and intermediaries, especially retailers, must collaborate as well. This generates its own complexity: Traditionally, the competitive advantage of a retailer is based on its ability to provide an appropriate assortment of goods for the targeted market that falls within its capabilities for connecting with one or more distribution chains. This traditional approach lowers transaction costs by bundling supply and demand. Customized solutions, in contrast, mean that assortment, efficient stock-keeping, and distribution are no longer the driving sources of competitive advantage. On the contrary, interaction skills and matching customization possibilities with the needs of a specific customer during the process of co-design are becoming the primary sources of competitive advantage (Sheth *et al.*, 2000; Seybold *et al.*, 2001). In traditional mass production, retailers are acting as a buffer between customers and manufacturers. In a co-design system, the manufacturer has to get access to information on each single customer in order to fulfill the customer's order, and potentially can match the retailer's advantage. As a result, there is a new demand for interaction and cooperation between customers, retailers and manufacturers. While this task is of general importance in many retailing contexts, we argue that co-design has even higher demands. It is therefore critical to design an appropriate cooperation setting.

The objective of this paper is to explore, discuss and evaluate different demands of collaboration between customers, retailers (as well as other intermediaries) and manufacturers for customer-centric strategies. Customer co-design (mass customization) provides an appropriate case to study new modes of cooperation that are relevant well beyond the niche of customized manufacturing. We believe that co-design and customer-manufacturer interaction are becoming a characteristic of many commercial transactions (Normann and Ramirez, 1998; Ramirez, 1999; Prahalad and Ramaswamy, 2004), and thus understanding co-design and mass customization may lead to widely applicable insights.

Cooperation in a co-design system provides a unique setting to perform innovative research on cooperation, as it is the objective of this special issue. We aim with this paper to expand the traditional discussion of cooperative arrangements in the management literature and enter new ground. We will limit our discussion to the relationships between customers, retailers, and manufacturers in *consumer goods markets*. Unlike in many business-to-business markets where customization is relatively commonplace (Homburg *et al.*, 2000), co-design has just started in most consumer markets. The focus of the paper is on the development, implementation and operation of customer interfaces for co-design activities, and we present four empirically derived modes of cooperation for performing these tasks. Our research is grounded in a case study of sport goods manufacturer *Adidas-Salomon AG*, a company heading towards customer co-design with its *miAdidas* system. The first author of this paper is the head of the unit responsible for this system at Adidas and collaborated in the study design and execution. The case study, which is described in the Section on Exploration I, drew upon the experience of the other, academic authors who provided preliminary research questions about the challenges of co-design based on research with other retailers. We used the findings from our qualitative database of more than 220 companies to identify four modes of collaboration for customization, as outlined in the section on Exploration II of this paper. After describing these modes, we will discuss them in the light of the *miAdidas* case, leading to a refinement and extended understanding of cooperation between customers, retailers and manufacturers (see the section on Evaluation and refinement by field feedback).

In general, the term co-design relates to a cooperation process, that is, a process of collaborative value creation, between two or more actors (Wikström, 1996a; Ramirez, 1999; Prahalad and Ramaswamy, 2004; Piller, 2005). The idea of 'co-design' and cooperation is used in three different ways in this paper. First, co-design describes the 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 (von Hippel, 1998; Khalid and Helander, 2003). Thus, customization requires co-design between the manufacturer and each customer to specify the desired products. Second, the organizational arrangement (organizational infrastructure, Sydow and Windeler, 1994; Reichwald, 2004) where customers and manufacturers perform their interaction collaboratively, has to be jointly developed and operated (co-designed) by the actors on the supply

side, namely manufacturers and retailers (in many cases, they operate this infrastructure together). Third, the concepts and findings presented in this paper are co-designed from a methodological perspective as a long-term and ongoing collaboration between the case company and the research team. We begin our discussion of co-design by describing this approach of knowledge co-creation in more detail.

Knowledge co-creation: a note on our research approach

While our objective is to discuss approaches for bridging the boundaries between manufacturers, retailers and their customers in order to build up individual and profitable relationships, the project is also the result of long-term collaboration between management research and management practice. We have invested seven years in cooperation between *Adidas-Salomon AG*, a leading sports company headquartered in Herzogenaurach (Germany), and the *TUM Research Group on Customer-Driven Value Creation*, based at the TUM Business School, Munich. This research cooperation provides a stable backbone of relationships and historical understanding of current management problems and strategies in customer co-design. The collaborative research approach we have gradually developed opens up an exciting field. Consistent with the *Munich School of Exploratory Research*, we see research as a circular process in which initial exploration is followed by co-design, piloting and evaluation of experimental solutions. Figure 1 provides an overview of the research process and its outputs. The format shown is one we typically use in our work together.

The trigger for the research project was clearly rooted in the joint interest of Adidas and the TUM team to learn more about the business challenges and potentials of customization systems. Started in 1998, this research cooperation gave us the chance to co-create a joint perspective, to develop understanding of collaborative customer interfaces and to stepwise develop and refine the miAdidas customer interface. Figure 1 summarizes the three major steps we have taken to date:

Step 1: Starting from conceptual pre-understandings in 1998 (which we have since significantly refined), we jointly

developed the design for an in-depth case history of customer interface management at Adidas. The purpose of this case study was to explore specific challenges in the context of collaboration and customization (*'Exploration I'*). The outcome of this step (reported in the section on Exploration I of this article) gave us a deep joint understanding of the specific collaboration challenges of miAdidas (the co-design approach of Adidas) customer interface and resulted in an early systematization of potentially important collaboration challenges. This work has been presented and discussed at a number of conferences including the Annual Conference of the European Academy of Management in 2003, the World Congress on Mass Customization and Personalization in 2003, the MIT Innovation Lab Meeting in 2003, the AMA Educators Conference on Customer Relationship Management in 2004, the Hawaii International Conference on System Sciences in 2004, the European Conference on Information Systems in 2004 and the Annual Conference of the Strategic Management Society in 2004. Summaries of the work can be found in two book chapters (Piller *et al.*, 2003; Piller and Stotko, 2003), various academic articles (e.g., Reichwald *et al.*, 2000; Piller *et al.*, 2004a, b, 2005), and several practitioner-oriented publications (e.g., Berger and Piller, 2003). For a more comprehensive list, see www.mass-customization.de.

Step 2: Building on this early systematization, we contributed to a case database on customer co-design (mass customization) started in earlier projects by the third author (see Piller (2003) for documentation). With the inputs of our research group, it now contains more than 220 in-depth case studies in the field of customization spanning a time frame of more than 15 years. The database provides evidence about alternative models as well as success factors of, and barriers to customization (*'Exploration II'*). This phase of the research is described in more detail in the section on Multiple case studies as our base of exploration. Field feedback workshops and in-depth discussions at miAdidas finally lead us to the conceptual model of collaborative customer interfaces that will be presented in the sections on Models of collaborative co-design interfaces and four modes of cooperation in competition.

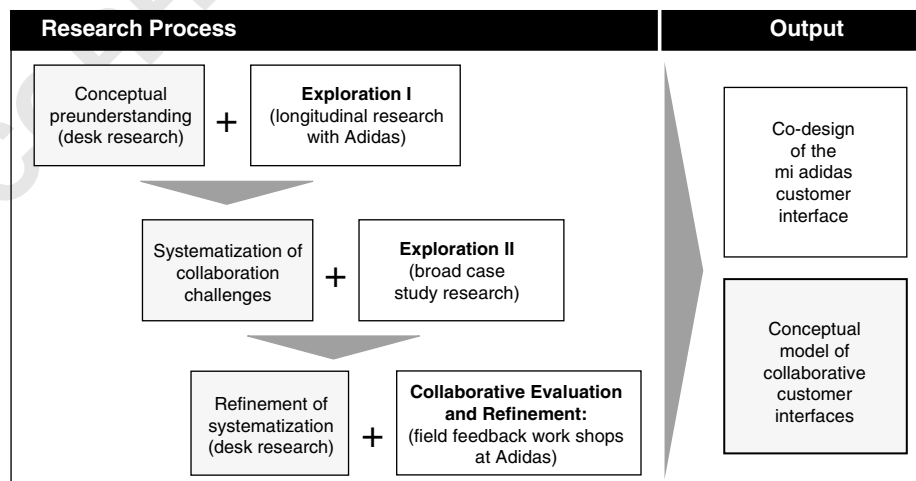


Figure 1 The exploratory research process.

Step 3: This takes the learning from Exploration I and II and aims at a *collaborative evaluation* and redesign of the early miAdidas model interface (see the section on Evaluation and refinement by field feedback). In an interdisciplinary research project funded by the German Federal Ministry of Education and Research, we evaluated the state of the miAdidas customer interface, based on the understanding generated in Step 2. Ongoing cross-industry evaluations that accompany the co-design process will help us to further refine our conceptual understanding (*‘Refinement’*).

Q1 Our research process can be seen as a ‘hermeneutic spiral’ (Ödman, 1985; Gummesson, 2000, 70) from pre-understanding to a mature model in an iterative process whereby each stage of the research provides a new level of shared knowledge. The research also illustrates the *Munich School of Exploratory Research* aiming at the co-creation of knowledge in close collaboration between management research and practice (Koller, 2000; Möslin, 2005). This approach is rooted in the fundamental work of Eberhard Witte, who established his school of empirical management research in the German business administration community in the late 1960s and early 1970s (Witte, 1968; Witte, 1977a, b; Hauschildt and Grün, 1993). Witte’s work was an important starting point for a fruitful debate in German academia on exploratory management research in the 1970s and 1980s that fostered a strong research tradition aiming at the co-construction of knowledge in exploratory settings (Köhler, 1977; Kubicek, 1977).

Q2 The exploratory management research presented in this paper can also be described as following a ‘construction strategy of empirical management research’ (Kubicek, 1977). It looks at management research as a ‘design science’ that does not stop with normative design suggestions but rather pilots and evaluates design suggestions in field experiments in order to generate real world evidence as a basis for theory development (see similarly Witte, 1997a, b; Gummesson, 2000; van Aken, 2001; Tranfield, 2002; Möslin, 2005). This approach implies a longitudinal research process in order to detect cause-effect relationships in real world settings (Van de Ven, 2002). The underlying research strategy of this School of Exploratory Research can be seen as an early attempt ‘in search of mode 3’ (Huff and Huff, 2001; see also Gibbons, 1994; Gibbons *et al.*, 1994; Huff, 2000, 2002). It moves away from traditional science approaches to co-construct management knowledge that takes into account values as well as different ways of working in real world settings. The German Federal Ministry of Education and Research strongly supports this co-construction of knowledge in management research by fostering exploratory project designs that pilot and evaluate management and technology innovations in interdisciplinary partnerships between management research and management practice.

Q3

Exploration I: miAdidas – a case study on co-design

History of collective experience

As already described, this research is based in cooperation starting in 1998 between the sports goods manufacturer Adidas and the TUM team. Our ongoing collective

experience has to be seen in the competitive context of the sports shoe industry (see also Berger and Piller, 2003; Seifert, 2002). The five biggest brands in this industry – Nike, Adidas, Reebok, Asics and Puma – no longer do their own manufacturing, but rely on strong outsourcing, often to the same suppliers (to ease our argumentation, we nevertheless will refer to Adidas in the following as ‘the manufacturer’). The core competencies of the named companies are the recognition of market trends and the design and development of new products. Extensive market research activities, lean contract manufacturing systems, sound forecasting skills, good supply chain management, and strong brand management are seen as the preconditions for success within the industry. However, during the course of our research, even the two market leaders, Adidas and Nike, have been facing problems. Their brand names are being attacked by new, trendy fashion labels, product life cycles are becoming shorter and shorter, heterogeneity of demand is rising, brand loyalty is decreasing fast, and consumers are more price sensitive than ever before.

Recognizing that consumers with great purchasing power are increasingly attempting to express their personality by means of product choices, Adidas (as almost all suppliers in the sports good industry) has been forced to create product programs with an increasing number of variants (differentiation by means of variety). This development makes forecasting and planning ever more difficult for the company. The consequences of miscalculation are increasing fashion risk, further supply chain complexity, high overstocks and a need to give large discounts in order to get rid of unwanted products. On the other hand, products that perform better than expected, but are not available in adequate quantities or sizes, generate the immediate problem of lost sales and the potential for lost market share.

As a consequence of the changing competitive situation, Adidas management realized that implementing made-to-order manufacturing instead of made-to-stock variant production could become a promising option to manage the costs of variant explosion and broad product assortments. They therefore decided to head towards mass customization. In a joint effort between the TUM team and Adidas’s project group (headed by Christoph Berger), the customizable product range miAdidas was developed and launched in test markets in 2001. The program makes customized shoes available to consumers in specialized retail stores and at selected events. Consumers are given the opportunity to create their own unique footwear to their exact personal specifications in terms of fit, function and design. The company thus provides a service that until now was only available to top athletes. The shoes are offered in selected markets at a premium of 30–50% above the price of an in-line (standard) product.

By means of a foot scanning system, the customers’ feet are scanned to determine the exact length, width and pressure distribution of each foot. This information, combined with personal fit preferences, is entered into a computer to determine the best-fitting shoe. After customers have chosen their personalized function and fit, they have the opportunity to test physical prototype shoes. Once satisfied with fit, the customer designs the color elements and selects material preferences. All of these steps are performed with the help of a sales kiosk leading the



customer through the co-design process, supported by a sales clerk. The system also visualizes the results and connects the point of sale with subsequent fulfillment systems. All shoes are made-to-order in an Asian factory and delivered to the consumer within three weeks.

Two channels are used by the company: First, during special retail events in traditional retail outlets, independent retailers offer miAdidas products to their leading-edge consumers. Second, miAdidas products are sold at various locations during major sporting events (like major marathon runs or the Soccer World Championships). In the first case, a retailer books an Adidas team as a facilitator, but makes the sale within its own system. In the second approach, Adidas sells shoes directly to the end user. Re-orders based on an existing customer profile can be placed by customers from both channels in an Adidas-owned call center by phone or over the internet.

Collaboration challenges: learning from exploration I

Today, miAdidas can be considered as one of the premier examples of a customer-centric strategy implemented by a large consumer goods company. The strategy has strong implications for the design of the entire value chain, and potentially, the sporting goods marketplace as a whole. Consumer interest has proven to be very high, and supply chain (manufacturing) issues of miAdidas are mainly solved (see Berger and Piller, 2003; Seifert, 2002). However, managing the multi-stage cooperation required for value creation between customers, retailers, and the manufacturer is still a hurdle to scale-up of the system.

Several critical incidents during the piloting phase of the miAdidas projects involved conflicts between the company and its retailers. Exploring these challenges presents the first level of our research model presented in Figure 1 (Exploration I). Succeeding workshops and discussions between the research team and the Adidas team identified *three especially challenging areas* resulting from new demands made by mass customization for handling customer interaction, customer relationships and collaboration between all actors.

Transition from product marketer to solution provider

In traditional sales channels, the involvement of retail personnel is often below manufacturers' expectations. Many end consumers do not have the necessary knowledge to specify an individualized solution that corresponds to their desires. An important sales task is to assist them during the co-design process. Demonstrating competence and service experience in sales has become one of Adidas' top priorities. Retailers, however, are often not prepared for this step. Sports shoe retailers are used to selling products, not to co-designing them with their customers. Adidas has overcome this problem for the time being by sending its own team of experts into the stores on an event-based basis. But if the miAdidas system is going to gain major market share, this solution is far too expensive. A related challenge emerges from the retailer's perspective as well: When selling standard goods, the manufacturer of the product is seen as responsible for quality failures and is responsible for product liability. In a mass customization system, however, the retailer is more likely to be seen as responsible

for perceived inadequacies with the final product, even if the error is based in the fulfillment system of the supplier. The twin problems of increased responsibility lead to the following questions that a cooperation strategy for mass customization has to address: How can the retail personnel develop an adequate skill level to communicate the interaction possibilities of miAdidas to consumers? What can prevent biases toward standardized products in retail? Could other efforts by manufacturers motivate customers to cooperate more actively in a co-design strategy?

Ownership of customer relationships

Properly implemented, some observers of miAdidas believe it could become the company's premier tool for increasing customer loyalty. Data from the foot scan and about the fit preferences of a customer can be used not only to fulfill the first order, but also to make re-orders easy. Owing to the need to obtain physical data, Adidas has to cooperate with retailers to get this data. A re-order, however, can be processed by phone or internet without the usual problems connected with distance shopping. The resulting closer relationship could rekindle brand loyalty, provide a competitive opportunity for differentiation, and increase the 'share of customer' (i.e., the aggregated profits a firm makes with one single customer). To fulfill this potential, the co-design process has to be designed to get as much information as possible from a customer. Getting feedback data immediately after delivery also is important to extend knowledge about each customer (Pine *et al.*, 1995). This implies a major source of conflict: Who owns the customer data and who will take re-orders? At this point, Adidas would have all the information for selling re-orders in a direct channel, which is much more profitable than using the retailer. Also from a consumer's perspective, a direct sale is often more comfortable. Then why should a retailer invest in getting a customer into the system during the first interaction when the fruits of that contact are likely to be reaped by the manufacturer? More specifically, how can the retailer be motivated to get feedback data (after delivering the goods) and to share it with the manufacturer? Is the manufacturer willing to use this information to improve the joint relationship with a customer?

Access to market research information

Co-design offers a unique opportunity for Adidas to obtain market research data by aggregating the data on individual customers (Kotha, 1995; Piller, 2003). The results can improve not only the customized product line but also standard lines by providing more accurate forecasting of customer needs and trends (Fowler *et al.*, 2000). The mass customization segment can be seen as providing panel-like market research information. Data such as color combinations selected in the co-design process are important in order to improve the appeal of standard models. However, retailers could also use customer knowledge gained from mass customer orders to improve the standard products they offer across brands. Further, they might be interested in sharing this information with other suppliers.

The potential conflict between retailers and suppliers is strong enough to prevent the gain of learning economies and synergies that have been described as distinguishing

the customized from the traditional systems (Piller *et al.*, 2004a). This is of critical importance in Adidas' effort to become more customer-centric. The corporate objective for investing in the miAdidas business unit is not primarily to cope with growing heterogeneity of demand by means of efficient customized production, but to explore new ways for the company to become more service, experience and customer orientated. miAdidas serves as a pilot unit for the whole company to explore several business practices that break with the traditional mass production system that still builds the foundation of the company. The success of this potential paradigm change is once again dependent on the quality and mode of collaboration with retail (Gummesson, 2002). Early in our research project, we therefore identified the need to find ways to realize the potential synergies between the customized and the traditional system for both Adidas and the retailer.

Systematization of the cooperation challenges: Reflections on Exploration I

When stepping back and looking at these collaboration challenges from a strategic management perspective, Adidas' cooperation challenges can be interpreted as an effort to enlarge the absorptive capacity (Cohen and Levinthal, 1990) of the manufacturer to learn from the customers' needs and demands during the co-design process. The concept of absorptive capacity is a term closely connected to the resource dependence approach (Pfeffer and Salancik, 1978). This approach looks essentially outside the firm for explanations of the patterns through which firms allocate external resources to activities creating competitive advantage. Customer input can be considered as an external resource that is increasingly critical for firms (Homburg, 2000; Lengnick-Hall, 1996). Within this discussion, the absorptive capacity of the firm has been described as its ability to access, value and utilize new external resources (Cohen and Levinthal, 1990). This capability is needed to 'bridge' (Scott, 1992) the distance between the organization that owns the critical resource (here: the customer) and the organization that is dependent on this resource (the manufacturer). Customer co-design processes can be interpreted as a means for each of the involved firms to get access to this information resources (which in turn will be used to create competitive advantage as described in the previous section), and co-design interfaces are the locus where this access is taking place (Piller, 2005).

Zahra and George (2002) develop this concept further and argue that four distinctive, but complementary capabilities compose a firm's absorptive capacity. They, hence, define a firm's absorptive capacity as 'a set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability':

- *Acquisition* is defined as the firm's capability to identify and acquire external information and knowledge that is critical to its operations.
- *Assimilation* describes a firm's routines and processes allowing the firm to process, analyze, interpret and understand information from external sources.

- *Transformation* is the capability to design and re-design the routines that facilitate combining existing knowledge and the newly acquired and assimilated knowledge.
- *Exploitation* capability is based on the routines that allow firms to refine, extend, and leverage existing competencies or to create new ones by incorporating acquired and transformed knowledge into its operations.

These four dimensions provide a new lens to interpret and systematize the collaboration challenges discussed so far:

- *The acquisition challenge* relates to the operation of the co-design interface in sufficient customer proximity (Kotha, 1995; Zipkin, 2001). This includes the requirement that those interacting with the customers at the site of the manufacturer or retailer are both motivated and enabled to collaborate with customers and to access and process their input. This demands skills that differ significantly from traditional skill requirements for sales personnel, as we have seen in the case of Adidas. Initially, the company 'solved' the sales problem by sending its corporate team of experts into stores on an event-based basis. For a broader diffusion and adoption of co-design at the customer interface, firms taking a co-design approach will have to more fully rethink the qualification schemes of the employees involved. The skills of these employees will have to be supplemented by an adequate technical infrastructure (often referred to as toolkits for user co-design: Franke and Piller, 2004; von Hippel, 2001) where the co-design processes are performed.
- *The assimilation challenge* increases the specific demands on the qualifications and skills of those involved at all levels of the value chain in interacting and collaborating with customer information. They have to acquire input from the customer that can be used in the firms' internal processes, to transfer the information acquired to the right internal organizational units, and to communicate with external and internal parties in a way that enforces (and ideally improves) the information acquisition and transfer over time. Appropriate incentive systems are a key element to master this challenge as we have seen when looking at the ownership of customer relationships and the channel conflicts and incentive traps implied.
- *The transformation challenge*: Co-design offers access to a rich stream of information that allows the firm to cut back on fixed costs that came about due to the necessity of maintaining a high level of operational flexibility. This cost saving potential is founded on the capability to design and re-design the routines to utilize co-design information and to combine this information with existing knowledge to improve the efficiency of the whole value system (De Meyer, Dutta and Srivastava, 2002; Rowley, 2002; Thomke and von Hippel, 2002). Further, this challenge includes utilizing the information from the co-design process to enhance the loyalty of customers towards the firm (Pine *et al.*, 1995). Change management is required to support the transformation capabilities of a firm and its employees. The objective is to prevent a new 'not-invented-here' syndrome and to avoid, as described earlier, the negative scenario that



might arise from conflicting interests of retailers and suppliers. A key requirement that has to be addressed early in the process of implementing co-design options is therefore to identify and realize synergies between the traditional and the new system for retailers and manufacturers.

- *The exploitation challenge:* This is the largest and most extensive task. Whenever co-design initiatives are first implemented as pilot initiatives, but not as part of the standard routines of the organization, the key challenge is to exploit the initial learning process and the competencies acquired during the piloting phase and to transform them into standard organizational routines for the larger organization. In the case of Adidas, the initiative has been set up as a separate business unit with its own responsibilities and a clearly distinct profile under the leadership of the first author of this paper. To achieve a broader diffusion of the co-design concept, however, the seamless integration of the co-design system with the existing operations of Adidas corporation is seen as a major requirement. This would require major cultural, structural and strategic changes in the organization. Co-design may also reduce intra-organizational barriers of information transfer and improve inter-functional cooperation within a firm. Mintzberg (1994) regards informal information based on conversations and interaction among managers of one firm with its customers and suppliers as the firm's most important knowledge. By creating a platform for co-design, product development engineers and marketing managers, for example, might start to interact much more intensively. New product development is forced to open channels to the firm's customers and listen to them, while marketing managers are getting more awareness for new needs and demands of the existing customers at the same time. This opens important avenues to support a firm's quest for more customer centrality (Sheth *et al.*, 2000).

We will use this systematization of collaboration challenges based on the four dimensions of absorptive capacity as suggested by Zahra and George (2002) to discuss and evaluate different modes of cooperation in customer-centric business strategies.

Exploration II: Structuring modes of collaboration

The understanding developed during the in-depth case history of customer interface management at Adidas provided us with insights into a number of unique competitive advantages for a firm becoming more customer-centric, but it also identified new challenges and demands resulting from a new demand for cooperation between customers, retailers, and manufacturers. We believe that these challenges are not specific to miAdidas, but are shared by many firms heading towards customer-centric business models and more especially by firms developing customized offerings (Sheth *et al.*, 2000; Agrawal *et al.*, 2001; Zipkin, 2001; Piller and Tseng, 2003). Hence, we looked at other companies in similar situations in order to find potential answers to the challenges identified in the case of Adidas during Exploration I (see again Figure 1). The objective of this second round of

exploration was to understand how other companies following customer-centric strategies addressed the collaboration challenges.

Multiple case studies as our base of exploration

Customer co-design and mass customization are still rather young fields in practice, characterized by a heterogeneous population of firms and approaches. Understanding the inner structures and complexity of rather new phenomena calls for case study research that can ultimately be used for theory development. Thus, case studies are once more becoming accepted as a scientific tool in management research (Eisenhardt, 1989; Daft and Lewin, 1990; Bettis, 1991; Kotha, 1995; Gummesson, 2000; Shipp, 2002; Danneels, 2003). In collaboration with Mr. Berger, the TUM team selected a *company panel* of 20 firms according to the following criteria. As described above, we focused further research on companies with a mass customization program in the consumer market. In addition, we tried to identify firms that were often quoted as a leading example of mass customization in their industry.

The starting point of Exploration II was a proprietary database of our research group documenting roughly 220 companies following customer-centric strategies (with a focus on mass customization). The objective of this database is to document and evaluate different aspects of mass customization and customer-centric value creation (for details see Piller, 2003). To identify further cases, we conducted expert interviews with academics and consultants at conferences related to the topic (like the MCPC World Conference on Mass Customization and Personalization, 2001 and 2003), and an analysis of the academic and practitioner literature (based on a literature search in ABI/INFORM Global by ProQuest; Business and Industry Database by Gale Group; Jupiter Research Report Database by Jupiter Communications; ProQuest General Reference by ProQuest. In addition to scholarly references, these databases include a wide range of trade and business journals, newsletters, and regional and international newspapers, which are important sources given the very limited amount of academic publications on the topic).

From the mass customization database, we chose companies that had operated for a period of at least three years in order that they could have moved down a learning curve. The further screening criteria was that detailed information on collaboration between the manufacturer, its customers and its retailers or other intermediaries was accessible.

As a result, Table 1 lists the companies that were chosen as primary sources of information to address miAdidas' cooperation challenges. These cases had been developed from primary sources, with the manager in charge of the customization program (which was often the CEO) as the primary source of information. Semi-structured interviews were also carried out with other members of management and data was collected on company visits if possible. This information was complemented by information from secondary sources, including expert interviews with outsiders. In Exploration II, all existing information was updated. In 11 of the identified cases, we had to extend the existing interview material by another round of interviews,

Table 1 Cases in company panel covered for Exploration II

<i>Company</i>	<i>Products</i>	<i>Markets</i>
Archetype (www.archetype.com)	Casual clothing	USA, Canada
Creo@Otto Versand (not in operation any more)	Fashion shoes	Germany
Custom Foot (not in operation any more)	Dress shoes	USA
Dell Computers (www.dell.com)	PCs	Worldwide
Dolzer (www.dolzer.de)	Men's (formal) wear	Germany
Factory 1to1 (www.factory121.com)	Swiss watches	Europe, USA
getCustom (not in operation any more)	Online shop for various customized goods	USA
Interactive Custom Clothes Company Designs (www.ic3d.com)	Jeans	USA
Lands' End (www.landsend.com)	Trousers and shirts	USA
Left Foot (www.leftfoot.com)	Footwear	Finland, UK, Germany, Japan
Lego (www.lego.com)	Comics, special toy kits (Mosaic product line)	Worldwide (major markets are USA, Canada and Germany)
NikeID (www.nike.com)	Sport shoes (design)	USA, Germany, Japan
Possen.com (www.possen.com)	Apparel	Netherlands
real Age (www.realage.com)	Personalized health recommendations	USA
Reflect (www.reflect.com)	Cosmetics and body care	USA
Selve AG (www.selve.net)	Women's footwear	Germany
Sovital (www.sovital.de)	Vitamin products	Germany
Timbuk2 (www.timbuk2.com)	Bags and luggage	USA, Canada (minor markets are Europe)
Westbury by C&A (www.CundA.de)	Men's (formal) wear	Germany
Xaaaz (not in operation any more)	Online shop for various customized goods	Germany

as the existing transcripts seemed either outdated (in the light of information gathered through recent secondary sources) or were not complete enough with regard to the subject focused on in this research. Four of the 20 cases identified in our preliminary screening were no longer in business when we started this research. Whenever a company had to close its operations, we tried to follow-up to get insight into the reasons and the background of failure (this was possible in three of the four cases).

To gain deeper insight into the nature and phenotypes of cooperation in co-design settings, we tried to identify all players involved in the co-design process and to evaluate their role and tasks in this process. The field research data were analyzed following suggestions by Yin (1994) and the example of Homburg *et al.*'s (2000) study of change in customer-focused organizations. First, the notes and additional documentation of our interviews were reviewed to identify (1) how the co-design process was organized and which actors were taking part, (2) which organization was the driving entity when implementing the system, (3) which player was seen by the manufacturer as being responsible for the co-design process from the consumers' perspective, and (4) who had control (ownership) of customer data and if they were using them in order to generate re-orders or facilitate cross-selling activities. Summary statements of the key cooperation issues were organized in text files, and key quotations and examples were stored with these summaries to allow discussion among the authors. Since the goal of our long-term research project is to look for integrative themes that could encompass demands for cooperation that heretofore have been discussed in isolation, we went through a highly iterative process of exploration to identify

relevant themes, as recommended by a number of qualitative researchers (e.g., Hirschman, 1986; Eisenhardt, 1989; Belk *et al.*, 1998; Gummesson, 2000).

Within this iterative process of exploration, we discussed in group sessions among all authors the most frequently mentioned forms and demands of cooperation between manufacturers, retailers and customers for each case and then narrowed these down to the most broad-based and significant modes of organizing. Informants often used different terminology for the same type of activity or change, so we identified which individual change efforts could be categorized under more general themes. Our attempt was to develop a holistic framework of cooperation forms and then identify the factors leading to these modes in the opinion of interviewees.

Models of collaborative co-design interfaces

The starting point of our paper was the observation that firms moving towards more customer-centric business strategies, and especially towards co-design, are facing new cooperation challenges. Applying the methodology described in the section on Exploration I, we could identify different modes of how this cooperation was organized. To distinguish these modes, we first determined the actors involved. Potential actors included the manufacturer (manufacturer refers here to the OEM or brand owner, there might be independent suppliers involved into the actual customized production process, which are, however, out of the scope of this research), the customers, retailers and other third-party intermediaries. In our company panel, the following basic modes could be identified:

- The cooperation between the manufacturer and the customers takes place without any involvement of a retailer or other third party.
- The cooperation between the manufacturer and the customer is moderated or facilitated by a retailer that used to be part of the existing distribution chain of the manufacturer.
- The cooperation between the manufacturer and the customer is moderated or facilitated by a new intermediary that was not part of the initial distribution chain.

Secondly, we determined which organization was the driving entity when implementing the co-design system. In all cases, our interview partners stressed that one partner almost always initiated co-design and thus also started the cooperation with the other actors that became involved in the system. In our case studies, we found examples where either the manufacturer, the retailer or an intermediary initiated the co-design system.

We also examined a number of other contingency factors identified in the literature to differentiate modes of cooperation, including the product category (Zipkin, 2001), the complexity and customized possibilities offered (Duray, 2002), the ‘turbulence of the market’ (Pine, 1993), that is, the competitive situation and maturity of this market, or the customer structure (Piller and Müller, 2004). However, these factors delivered no clear point for differentiation. Thus, the case studies were grouped into four forms, based on (1) the *actors involved* in the cooperation and (2) the *driving entity* in initiating the cooperation (see Figure 2).

Customer direct: In this form, the manufacturer and the customer interact directly in the co-design process. The initiator of the customer-centric strategy is the manufacturer who also implements a co-design interface (in many cases as part of its website, but also in its own stores). In our sample, we could observe this form at Dell Computers,

Dolzer, Interactive Custom Clothes Company Designs (IC3D), Lego, NikeID and Reflect.

Manufacturer-driven collaboration: In this form, the manufacturer includes existing retailers into the co-design system who facilitate the interaction with the customer. The initiator of the system is the manufacturer who also develops the co-design interface that is later implemented in the existing retail system. The manufacturer is also the actor that is responsible from the customers’ perspective for the co-design system and its outcomes. In our sample, Adidas as well as Factory 1to1, Left Foot, Selve, Sovital, and Timbuk2 operate according to this model.

Retail-driven collaboration: Here, the retailer takes the lead and both initiates and operates the co-design system, using, however, a closely integrated manufacturer responsible for (and also finally enabling) the customized manufacturing of the co-designed solution. From the perspective of the customer, the retailer is the responsible entity for the co-design system. Case examples include Creo@Otto, Custom Foot, Lands’ End and Westbury by C&A.

Intermediary-based collaboration: In this form, a third party was considered to be the driving actor in the co-design process, supporting it between the manufacturer, retailers and customers. The intermediary does not replace the interaction between the retailer (or the manufacturer) and the customer, but provides specialized capabilities to facilitate this process. In our sample, the companies Archetype, getCustom, Possen, real Age and Xaaaz were examples for this mode.

From our case study research, it seemed that all four modes of cooperation have distinctive strengths and weaknesses in the light of customer-centric business strategies. As a next step we therefore had to refine our understanding of how these different modes of cooperation might cope with the collaboration challenges associated with the four dimensions of absorptive capacity identified earlier.

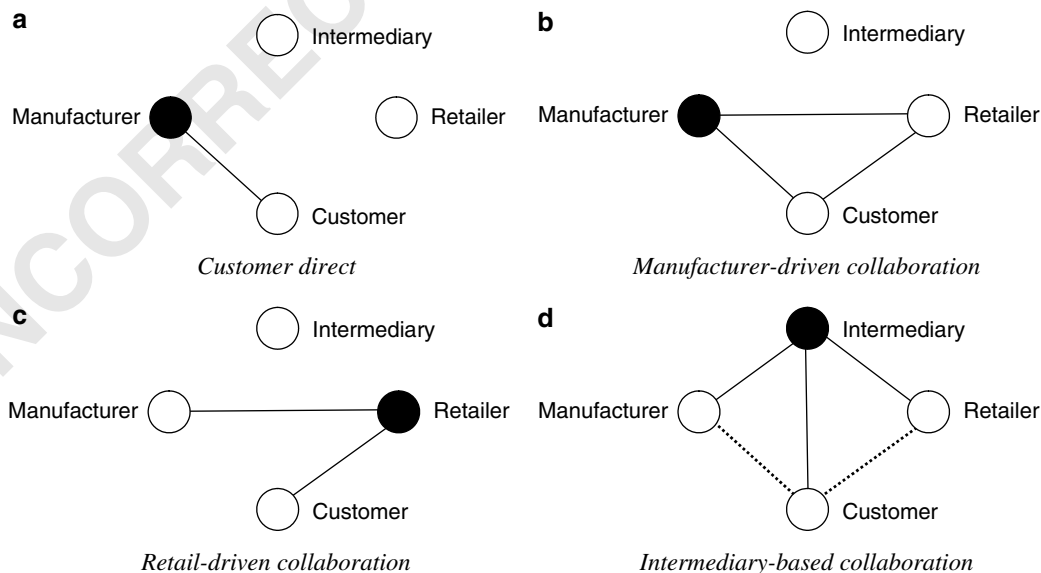


Figure 2 Four modes of cooperation (the filled circle indicates the actor initiating the cooperation). (a) Customer direct. (b) Manufacturer-driven collaboration. (c) Retail-driven collaboration. (d) Intermediary-based collaboration.

Four modes of cooperation in competition

The four modes of cooperation are clear competitors in the market of current co-design approaches. To better understand the different modes and to evaluate their strengths and weaknesses for addressing the absorptive capacity challenges of acquisition, assimilation, transformation and exploitation, we

- first analyzed the specific profile and extent of the absorptive capacity challenges that each of the four modes showed in the context of our company panel and
- then isolated promising practices and early solutions to overcome these challenges that we identified in the case companies.

This process was the primary subject of the third phase of our collaboration. In the fourth and final stage of our research process, these findings were refined using field feedback from the Adidas case.

Consumer direct

A striking observation in our broader case study was the large number of firms traditionally relying on multi-level retail channels to distribute their standardized products that chose to interact directly with their end consumers (and risk clear channel conflicts) when introducing co-design. When Nike started mass customizing with NikeiD, for example, the company decided to offer this product only via its own website. Apart from lower transaction costs due to the 'design it yourself' approach (rather than initiate a partnership), the main motivation behind this decision was to learn, gain experience and absorb weak market signals by interacting with consumers directly, usually on the internet.

The motivation to learn more about the customer must be a strong driver to overcome the *acquisition challenge* that is the dominating challenge in this mode. Manufacturers in consumer goods markets may have systems and routines to apply market research techniques and utilize this data in the new product development process, but they inevitably lack all the capabilities required to interact with customers directly and to process customer information on an operational (daily) base (Piller, 2005). This challenge can be addressed, at least in part, through additional individual incentive systems, but learning can also be seen as a relatively strong incentive in itself at an organizational level. From a customer's point of view, direct collaboration with the consumer is often the best approach as well: There is only one contact name and no confusion as to who is responsible for re-orders, feedback or complaints.

To avoid channel conflicts, firms using this approach to co-design usually argue that the co-design product would be much too labor intensive, and thus costly, if it were sold offline. A retail channel would just add an additional level, especially as today electronic commerce allows manufacturers to communicate and trade with large groups of consumers directly and efficiently (Lee *et al.*, 2000). Similarly, some managers on the panel established to help guide our overall project argued that co-design has to be seen first of all as an attempt to build a brand image, which creates benefits for retailers, too.

An organizational solution to prevent channel conflicts is to handle customized and standard product lines through clearly distinct distribution channels: the co-design offerings are placed online in a consumer-direct mode, and the standard product lines are sold in conventional retail outlets. From an absorptive capacity perspective, there are pros and cons for this approach: As configuration and purchasing are fulfilled without any intermediaries, customer information can be absorbed and directly used in the manufacturer's internal processes (*assimilation and transformation challenge*). Further, the manufacturer's incentive systems can facilitate corporate learning from customer knowledge. Skills and qualification requirements for co-design, however, will most probably differ significantly from those usually available at the customer interface of manufacturing firms. In addition, separating the co-design and the standard offerings may be a large hurdle to overcome the *exploitation challenge*, that is, to refine, extend and leverage the existing competencies of the firm by incorporating the acquired knowledge from the co-design processes into its operations.

This can be observed quite easily in the case of Reflect, P&G's internet-based offering of customized cosmetics. Using interactive software, customers of Reflect.com can create their own cosmetic line, mix and match various options like colors, scents and skin-care preferences to create a unique product at off-the-shelf prices. A facility in upstate New York manufactures the product, and a call center in Cincinnati handles follow-up interaction (Warner, 2001). P&G decided to sell direct, passing by the retail channels that are usually distributing their products. With experience, however, Reflect's management realized that they needed further contact points with their target group to grow in new market segments. Many consumers are not willing, or not able, to customize cosmetics online. An online channel can never address all the sensual and tactile attributes involved in shopping for cosmetics. So recently, Reflect announced its plan to integrate also retail outlets where consumers can interact more closely with the system, learn about the products and create their first order (moving to a manufacturing-driven collaboration). A store-based setting, however, will become much more costly for the firm compared to the original online version.

From an organizational point of view, Reflect is operated fully independent from the other P&G operations as its co-design system breaks with the dominant logic of the mass production business of P&G's other divisions. The co-design system allows much richer interaction with customers, resulting in the access to market research information that is also very valuable for the mass market operations of the company. We learned that the possibility to access and transfer this information (*transformation challenge*) from the co-design system into the mass-market systems had been a major *raison d'être* for P&G to invest in Reflect (Piller *et al.*, 2003). In practice, however, this transformation proves to be much more difficult than anticipated, as there is very little common ground for an internal cooperation between Reflect and the P&G core entities. This also prevents the firm from transferring itself entirely into a more customer-centric operation, using Reflect as a corporate role model (*exploitation challenge*). This case study material available to us shows that in

addition to the collaboration challenges in-between the actors at the customer interface, further cooperation demands emerge inside a company that is moving towards more customer centricity (Vandermerwe, 1999; Reichwald and Siebert, 2004).

Manufacturer-driven collaboration

As just discussed, manufacturers typically lack the capabilities to interact with consumers and have to invest heavily in interaction systems to achieve this capability. Our database shows that many attempts to offer customization have failed as manufacturers do not acquire the capabilities and systems to interact effectively. Shifting the locus of value creation towards customers requires no less than a radical change in the management mind-set (Ramirez, 1999).

Several manufacturers in our company panel implemented their co-design strategies within existing retail channels, but remained the leading entity in the resulting cooperation, as we had already seen with Adidas. The general rationale behind this approach is that a retail partner should provide closer physical and information proximity to customers. An existing retailer will have much more experience in managing customer interaction in general, which should result in a more efficient handling of the co-design process on behalf of the manufacturer. Another advantage is simply the ability of retail to bundle customer interactions, therefore reducing the internal complexity of customization. Especially when selling online via an established retailer, the adoption of more advanced technologies justified by significant web traffic and higher levels of attention paid to an established retail website significantly speeds up market introduction (*acquisition challenge*). This approach can generate substantial absorptive capacity and at the same time makes sure the information absorbed is more accurate and timely in terms of customer needs and market trends. Manufacturer-driven collaboration might be the most adequate organizational model to absorb customer knowledge, experience and expectations (*assimilation challenge*).

The advantage of reduced complexity, however, implies in general a lower level of customer information absorbed by the manufacturer itself. Strong barriers and defense mechanisms, like 'not-invented-here' syndrome, can limit the transfer of information absorbed at the retailer to the manufacturer. This can increase the *transformation challenge*.

Nevertheless, there are advantages to this mode of collaboration dominated by the manufacturer. Especially from the perspective of a customer, the manufacturer is the provider of the customized product and the main interaction partner. The retailer just provides access and infrastructure for the co-design process. Customer data and customer relationships remain the property of the manufacturer who has the responsibility of managing and integrating information flows. Finally, cooperating closely with and learning from a retail partner can also be interpreted as a 'buffered mode' of direct customer-firm interaction for the manufacturer. Firms striving for more customer centricity have to provide more closely coupled connections with their customers (Danneels, 2003). But this

is a completely new task, demanding intensive change management activities from manufacturers (Normann and Ramirez, 1998; Prahalad and Ramaswamy, 2004). The integration of an independent entity thus supports manufacturers in coping with the *exploitation challenge*.

Retail partners may be closer to the customer and more used to dealing with them, but several problems still exist in this mode of cooperation. This research was initiated in response to the incessant problems experienced by Adidas after implementing its co-design system in such a mode. One major challenge already mentioned is to motivate external sales personnel so that the *acquisition and assimilation challenges* can be met. Retail is often characterized by a high turnover of sales clerks, low levels of education within the sales force and a lack of understanding of the need of relationships. As a result, incentive models have to be developed, and educational programs installed, to address the change from selling products and services to providing a more integrated, customized solution. Convincing retailers to share this investment is difficult as long as the share of benefits from customization is not clear. Retailers could be regarded as the potential beneficiary of major inventory reduction, decreasing fashion risk and the prevention of discounts at the end of a season resulting from customization. But it is the manufacturer's responsibility to enable these savings and to promote these possibilities to its retail partners.

Retail-driven collaboration

We also could observe cases where retailers initiated the co-design offering. Retailers often realize individualization needs faster and more precisely than manufacturers. In highly competitive retail markets, price competition often reaches a limit where further pressure to lower margins from suppliers is no longer possible. In order to find new ways of differentiation, retailers try to upgrade their offerings by becoming more service orientated. Consider C&A, a leading European apparel discounter. At the end of the 1990s, the firm's brand and product portfolio was neither fashionable enough to compete with emerging retailers like H&M or Zara, nor could C&A become the cost leader in its industry due to expensive inner city retail locations, large floor spaces and huge overhead costs. In this situation, mass customization was seen as a chance to upgrade customer service. C&A developed a new in-house brand, selling mass-tailored men's clothes at off-the-rack prices. The whole fulfillment system was outsourced to two supply chain partners, a clothing manufacturer that offered mass tailoring and a consultancy that was responsible for the process engineering and operational management. From the end consumers' perspective, however, C&A is the only visible actor and main cooperation partner in the co-design process. The manufacturer is acting as a traditional contract supplier, with the difference that each garment manufacturer requires a direct information flow to deliver co-design information to manufacturing. Only the retailer has full access to all customer information (being able to match configuration data with a customer's name). This model offers clear advantages in relation to the *acquisition and assimilation challenges*. We can assume that retailers who are motivated by their own strategic

motives to offer co-design are much more willing to invest in adequate customer interaction systems, and provide training and incentives to their employees to support customers in the co-design process. Customers see 'one face' and major interaction partner in this system, handling complaints and signaling trust.

Case experience shows, however, that key challenges in this model are, first, the task of information absorption at the manufacturer's site and, second, the use of this information to continuously change manufacturer operations according to changing market needs (*transformation challenge*). The retailer is usually the one to learn directly from the customers and develops capabilities to understand the broader needs of a customer interaction. But often, retailers neither have the capability nor the motivation to transfer this knowledge adequately throughout the supply chain, as they lack control over the different supply and manufacturing steps. On their side, manufacturers, too, often lack the absorptive capacity to take up this information (Verona *et al.*, 2004). Manufacturers have 'no open line', as an Adidas executive expressed the problem in one of the interviews. Given that adequate incentive systems are in place, retailers could become this open line for the manufacturer. The major challenge of the retail-based collaboration model can be seen with regard to the *exploitation challenge*. From the retailer's perspective (initiating and profiting most from the co-design system), introducing co-design and product customization shifts the sources of strategic advantage to another field. Compared to selling products from stock and competing on the capability to select the right location, bundle appealing assortments and forecast inventory levels precisely, retailers now have to manage new issues like product design, complex product architectures, co-design toolkits, manufacturability and individual order tracking (Reichwald *et al.*, 2000). Every sale depends on cooperation with the manufacturer. This long-term extension of the manufacturers' set of competencies can become a huge opportunity for retailers to 'move upstream' (Wise and Baumgartner, 1999), increasing their share of the value chain. On the other hand, in a co-design system, they depend more on the manufacturer than before and have to acquire knowledge and competencies about the custom manufacturing process to handle the resulting principle-agent situation (von Hippel, 2005).

Intermediary-based collaboration

The last mode of cooperation adds a fourth actor to the co-design system. Here, a specialized intermediary supports, but does not replace, the interaction between the customer and the retailer or manufacturer. The intermediary provides specialized capabilities to facilitate this process. Possen.com, a Dutch clothing company, provided us with an example of such an intermediary-based collaboration approach (Archetype follows a similar business model in the United States.) The company took three-dimensional body scans of consumers in main street 'scanning' shops as well as with a mobile scanning truck. Supplemented by personal fit and style preferences, the data was stored on a central database and delivered to participating, but independent, retailers selling made-to-measure clothes.

The retailers could use the scanning data without making a major investment in scanning equipment or skilled tailors to take the measurements. After order taking, Possen facilitated the data transfer to different workshops in Europe, where mass customization technology manufactured the individual clothes. The company's major business objective was to become the central body data broker for the industry, supporting the acquisition and assimilation challenge for independent retailers, while integrating the manufacturing and the retail system. Every time a body data set is used, Possen earns a percentage of the sales for providing its specialized capabilities.

In general, intermediaries like Possen can foster co-design in several ways: For many retailers the re-use of one configuration system (like the 3D body scanner in the case of Possen) decreases the investments to implement the system. Intermediaries could also develop core competencies in configuration, selection and assisting consumers in the co-design process. By task specialization they may be able to perform at a much higher performance level at lower costs (*acquisition and assimilation challenge*). They might step forward on the learning curve more quickly, again lowering costs. An intermediary may also avoid channel conflicts when the broker acts as the visible market player. It, therefore, could be in a good position to decouple knowledge gained while interacting with clients in order to deepen and re-direct market-driven and technological competencies for the whole collaboration network (*transformation challenge*). Finally, the intermediary-based mode of collaboration uses an independent third party to balance the interests of the manufacturer, the retailer, and the customer, hence supporting a sustainable *exploitation* of the co-design system.

In the beginning, however, the intermediary faces the same dilemma as the retailer in the retail-driven collaboration mode: it is the point of information absorption, but lacks the administrative power to transfer the information absorbed in an effective and efficient way to the other actors in the cooperation setting. In order to succeed, therefore, the intermediary first of all has to have a strong understanding of the value chain of customization and how to manage the seamless integration of all partners. This task is especially difficult as the intermediary has to acquire this knowledge from a position of having neither the product knowledge of a manufacturer nor the customer proximity of many retailers. From a transaction cost point of view, the introduction of a further player also brings additional communication costs that have to be counterbalanced by new savings (Bowen and Jones, 1986). The difficulties of data sharing may be the greatest in this mode of cooperation. We have already described the barriers to retailers and manufacturers sharing information. Now, a third party, the broker, claims ownership of jointly generated customer knowledge. Both retailers and manufacturers are likely to be especially reluctant to share if the broker is cooperating with other horizontally competing partners on the retail or manufacturing level, because privacy becomes hard to guarantee. Even if this problem is averted, new channel conflicts can appear if the intermediary broker gains so much knowledge that it is able to integrate vertically in value activities formerly performed by manufacturers or retailers.

Evaluation and refinement by field feedback

Following the research model described in Figure 1, we evaluated the modes of collaboration derived from our company panel in workshops and expert interviews with managers from Adidas. From a research perspective, the Adidas case provided the framework for an economic analysis, focusing our view and forcing us to evaluate our understanding from a real-world perspective. Adidas was motivated to participate in this evaluation as it was facing three major tasks resulting from its new co-design system: mastering the transition from a product marketer to a solution provider, solving the issue of who owned the customer relationship and getting access to market research information generated by retailers during the customer co-design process. Our analysis of the ability of each cooperation mode to cope with the absorptive challenges of acquisition, assimilation, transformation and exploitation was thus useful. Table 2 summarizes our findings. It shows the major strengths and weaknesses of different modes of collaboration to build absorptive capacity from a manufacturer's perspective; although, in fact, the details just outlined were refined in this last phase of our research.

At Adidas the situation was as follows when our research project started: Adidas's mass customization model required physical interaction with each consumer. At the beginning of its co-design initiative, Adidas owned and operated neither retail stores nor a direct internet sales channel. At this time, the consumer-direct solution was not considered as feasible due to the high costs of building a retail network from scratch. Also, the sales organization feared vast channel conflicts with existing retailers of the standard goods if Adidas entered the customer-direct mode. But a retail-driven system was not an attractive option for a brand conscious company like Adidas either, because it could not adequately control its image. Finally, the intermediary-based model could not be considered due to the sheer lack of such an intermediary in this industry.

Thus, the system of manufacturing-driven collaboration seemed like a perfect fit. It helped, first of all, to cope with the *acquisition and assimilation challenges* by bringing the co-design interfaces into sufficient proximity. By cooperating with retail, Adidas got rapid access not only to an existing physical network and an existing customer base, but also to the basic resources (employees) needed to perform the co-design activities. However, as already described, after the first pilot trial, Adidas learned that it had to bring its own people as temporary sales clerks into independent retail outlets as the retailers were not able to handle the complex interaction system and lacked both product and application knowledge to assist customers in the co-design process. This development required an even

higher degree of cooperation with retailers. However, when cooperating with retailers, Adidas wanted to be the clear leader of the system, especially as miAdidas was seen as a major means to strengthen the company's brand image by emphasizing innovation, leadership and customer service.

The traditional manufacturer-retailer relationship in this industry on an operation level is rather unconnected. For co-design, it had to be adapted to accept a new, closer kind of collaboration. A first step for Adidas was to establish new contract systems with its retail partners. Instead of selling bulk product assortments to key-accounts at the beginning of a season, Adidas had to offer a system of bonuses and additional incentives for building the contact to the customers, collecting their profile data correctly, and educating and delivering the possibilities of customer co-design in a more general way. This included a cash award for retailers for re-orders from customers who had established a customer profile at their store, even when the reorder came to another retailer or a direct channel belonging to Adidas (call center, internet). The introduction of such a commission system demands trust and a new kind of long-lasting relationship between the manufacturer and retail organizations. In all other modes of collaboration, acquisition and assimilation tasks are free from this channel conflict.

While a new commission system may solve channel conflicts, it still cannot solve the *transformation challenge*, which requires the capability to design and re-design routines that utilize co-design information and then combine this information with existing knowledge to improve the efficiency of the whole value system. This is one of the strongest benefits of a firm introducing co-design (Piller, 2005). Here, the retail-driven mode as well as the intermediary-based mode of cooperation are more challenging than the manufacturer-driven mode. From the perspective of the manufacturer, these modes create information-distance that is a hurdle in the absorption of customer knowledge, experience or expectations. The perspective of retailer is likely to mirror this experience: they often lack the capacity to relate customer information to product or manufacturing knowledge. Direct collaboration with the customer, as we have said, can be regarded as the superior way of mastering the transformation challenge.

The most interesting discussion in the evaluation stage of our project evolved around the *exploitation task*. In order to shift a customer-centric strategy like Adidas' co-design system from a pilot stage to a sustainable competitive strategy, the whole collaboration network has to establish routines that allow each partner to leverage their existing competencies by incorporating the newly acquired and transformed knowledge and experiences into the value

Table 2 Major strengths and challenges – a manufacturer's perspective

Mode of collaboration	Consumer Direct	Manufacturer-driven collaboration	Retail-driven collaboration	colla-	Intermediary based collaboration
Acquisition	MAJOR WEAKNESS		MAJOR STRENGTH		
Assimilation		MAJOR WEAKNESS			MAJOR STRENGTH
Transformation	MAJOR STRENGTH		MAJOR WEAKNESS		
Exploitation		MAJOR STRENGTH	.		MAJOR WEAKNESS

chain. This reinterpretation and creation of routines is closely related to the need for change management when becoming more customer-centric (Normann and Ramirez, 1998). The objective of Adidas was to use the co-design system to enable a new corporate strategy to 'go downstream'. In the sports goods industry, increasing competition and the expanding installed base of products is pushing the focus of economic value creation downstream, that is, away from manufacturing and towards selling and servicing products. Manufacturers' traditional value-chain role – producing and selling goods – is becoming less and less attractive. As a result, and one which can also be observed in many other 'manufacturing' sectors, revenues from downstream activities now represent 10–30 times the annual volume of the underlying product sales (Wise and Baumgartner, 1999). Becoming more customer-centric by introducing co-design is thus a very attractive means for manufacturers to move downstream.

The strategic vision of Adidas is to become as much a service provider as to develop and assure the manufacture of the latest sport shoes technologies. As a result, the miAdidas unit is regarded within the whole company as a pilot to explore new value-creating activities that might be transferred later to established divisions. Given the difficulties of, and internal resistance to, such a radical change process, the introduction of a retailer or intermediary as a buffering agent between the firm and the customers was seen as a catalyst to a needed change process. This argument, however, reveals an interesting trade-off: The more Adidas (and other manufacturing firms striving to become more customer-centric) cooperates with retailers or intermediaries in the co-design process, the easier the implementation of this system becomes. The existing absorptive capacities of the intermediary in the acquisition, assimilation and exploitation of knowledge can be utilized from the beginning. But the deeper these third parties are involved in the first part of the needed change process, the more difficult will the transformation and exploitation tasks become in a more mid-range to long-term perspective.

The same argumentation applies to a retailer who becomes the initiator and driving actor of a co-design design system. The retailer also can benefit enormously in the implementation phase from the assimilation and transformation capacities of the manufacturer, but the retailer can expect difficulties in a later stage when it wants to make the system an initiative to move upstream and gain a larger share of the value chain. Given the rather early stage of co-design systems in many industries, we can hypothesize that the fairly high number of successful co-design systems based on extensive manufacturer-retail cooperation, often with a rather balanced allocation of power and profits between both entities, will diminish. The more the co-design systems mature, the more we expect a move towards more centralized, independent systems of direct firm-customer interaction.

Table 3 summarizes our discussion up to this point.

For Adidas, the evaluation and refinement of this project led to a radical redefinition of its strategy of handling the customer interface for co-design. Despite its branding power and sales volumes, Adidas' management felt incapable of transforming independent retailers into solution

providers, enabling them to sell Adidas' customized product assortment in an adequate way and to provide sustainable access to customer knowledge in the long term. Given these considerations, Adidas decided to rescind its decision to base miAdidas primary on a retail-based system and to establish two new channels of interaction with its customers.

First, the miAdidas system is licensed to very few selected retailers willing to transform a shopping space in their store into a pure co-design environment. These retailers are carefully chosen based on their managerial and financial commitment to establishing a long-lasting cooperation for consumer co-design. The collaboration at the customer interface is thus based on entirely new contractual agreements. A first result of this concept can be seen in the miAdidas unit in a leading London department store. This shop-in-a-shop solution is a hybrid between a manufacturer- and retail-based system. The brand names and experiences of both partners are combined and co-branded towards the consumer. Sales results are very promising.

Second, Adidas decided to invest heavily in their own chain of Adidas owned and operated retail stores that will feature the miAdidas concept (consumer-direct mode). These 'performance stores' will become the major co-design and cooperation platform between the manufacturer and its consumers. The stores will help Adidas to better understand retail challenges and acquire 'retail thinking' (contrary to the still dominating thinking within the company that Adidas is a manufacturer). These stores are a major movement of the firm to move downstream and redefine its value system radically towards a more customer-centric business model. They trade-off the large challenges in regard to acquisition and assimilation of information in a manufacturer-driven collaborative model with retailers in favor of better transformation and exploitation from direct collaboration with the customer. Future refinements and evaluation will show if this new strategy will enable Adidas to benefit from its co-design operations and master any new challenges evolving from such a strategy.

Both strategic moves are in line with our basic observation that the capability of one collaboration mode to master the collaboration challenges may change over the course of time and stage of development of a co-design system. First introduced in 2001, the miAdidas co-design system has now reached a moderate level of experience and left its pilot stage. We believe the relative maturity of their co-design abilities is an important contingency factor leading to their need to acquire new knowledge and capabilities (Langlois and Robertson, 1995; Langlois and Cosgel, 1996).

Conclusion

We discussed co-design and cooperation at three different levels in this article. First, we presented a case study of Adidas, a company trying to develop structures and capabilities to facilitate a new level of cooperation with customers interested in co-designing customized footwear, and compared that experience with the experience of other companies developing similar co-design strategies. Second, we discussed how this new level of cooperation with

Table 3 Building absorptive capacity in the different cooperation modes (see Table 1 for description of case examples)

<i>Mode of collaboration</i>	<i>Consumer direct</i>	<i>Manufacturer-driven collaboration</i>	<i>Retail-driven collaboration</i>	<i>Intermediary-based collaboration</i>
<i>Company cases</i>	<i>Dell Computers, Dolzer, IC3D, Lego, NikeID, Reflect</i>	<i>Adidas, Factory 1to1, Left Foot; Selve, Sovital, Timbuk2</i>	<i>Creo@Otto, Custom Foot, Lands' End, Westbury by C&A</i>	<i>Archetype, getCustom, Possen, real Age, Xaaaz</i>
<i>Acquisition challenge</i> Challenge to build and operate the customer interface to perform co-design activities	<ul style="list-style-type: none"> ● Manufacturer usually lacks interaction capabilities; high investments required to implement interaction system. ● Strong organizational incentives to invest in direct interaction with customers. ● From a customer's perspective absence of interface problems. 	<ul style="list-style-type: none"> ● Use of retailers' existing experience of interacting with consumers efficiently. ● Sales channels and interaction points known to customers. ● Customers regard manufacturer who lacks capability to control behavior of retailers, as responsible for fulfillment. 	<ul style="list-style-type: none"> ● Existing systems optimized to utilize retail space and fast turnover; thus, lack of capabilities at the retail site to build sustainable interaction system connected with product architecture. ● Close proximity to customer, existing experience of effective and efficient customer interaction. 	<ul style="list-style-type: none"> ● Specialization of intermediary allowing for more sophisticated interaction systems at the price of higher complexity. ● Requires deep understanding of overall co-design value chain.
<i>Assimilation challenge</i> Challenge to provide the internal routines and processes to process the external customer information in the operational value creation process	<ul style="list-style-type: none"> ● Clear ownership of information and relationships allows for strategic approach towards customer centricity. ● Manufacturers have specific process knowledge (R&D, production), but usually lack interaction capabilities. ● Fundamental intra-organizational conflicts between traditional and co-design processes. 	<ul style="list-style-type: none"> ● Need to manage dual contact points and responsibilities at customer interface. ● Retailers/sales personnel often lack motivation to learn from direct interaction with customers and to transfer knowledge. ● Need to acquire new knowledge and skills necessary to perform co-design may demand investments of manufacturer into retail partners. 	<ul style="list-style-type: none"> ● Compatible incentives on organizational and individual level to absorb customer information at retail site. ● Manufacturer acting as traditional contract supplier usually lacks understanding of becoming solution provider. ● Quality of retailer-manufacturer collaboration decisive for transfer of customer knowledge. 	<ul style="list-style-type: none"> ● Potential for manufacturer to avoid internal conflicts and channel conflicts. ● Economies of specialization as well as economies of scale and enhanced efficiency at the customer interface. ● Additional complexity of ownership of information and relationships. ● Allows for lower learning costs at the sites of manufacturer and retailer.
<i>Transformation challenge</i> Challenge to utilize co-design information for building an efficient and customer-centric organization also on a strategic level	<ul style="list-style-type: none"> ● Channel conflicts (with conventional product lines) as major hurdle for strategic transformation. ● Manufacturers often lack capabilities to integrate customer input continuously in strategic planning ● New kind of "not invented here" problem. 	<ul style="list-style-type: none"> ● Often no clear ownership of customer relationships; manufacturers' potential for strategic transformation depends highly on role and position of retailer. ● Retailers often lack understanding of the need to pass information and customer feedback to manufacturer. 	<ul style="list-style-type: none"> ● Manufacturer in dependent role; collaboration between retailer and manufacturer often lacks strategic focus. ● Strategic opportunity for retailer depends on its abilities to control supply and manufacturing chain. 	<ul style="list-style-type: none"> ● Independent third party balances the interests of manufacturer, retailer and customer. ● Low potential and motivation for manufacturer to move towards strategic customer centricity. ● Shared reputation, exchange/re-use of customer data.
<i>Exploitation challenge</i> Challenge to transform the co-design system into a long-term, sustainable business model	<ul style="list-style-type: none"> ● External channel conflict with retailer; internal conflict between lines of business. ● Co-design activities in most cases started as pilot or decentralized business unit; re-integration in standard operations often very difficult. 	<ul style="list-style-type: none"> ● Manufacturer in dominant role: chance to build on customer knowledge from retailer. ● Retailer as buffer between customer and manufacturer: allows easier scalability of co-design system; decreases also internal change management efforts at manufacturer. 	<ul style="list-style-type: none"> ● Retailer in dominant role: chance to increase share of the value chain; challenge to collaborate more closely with manufacturer as well. ● Reduction of market uncertainty on the manufacturer side. 	<ul style="list-style-type: none"> ● Potential strategic role of intermediary as change agent for manufacturer. ● Manufacturer and retailer one step removed from locus of learning; additional partner may result in additional filtering; loss of information.

customers requires additional cooperation among suppliers, and how this cooperation also has to be jointly developed (co-designed) and implemented collaboratively by all partners in the value chain. Third, our investigation of these issues is itself a cooperative venture of over 7 years in which methodology and analysis is co-designed by a research team that links Adidas and TUM researchers.

Many studies of cooperation focus on the learning objectives of partners, whether or not they are realized over time, and the factors affecting these outcomes. Given the interests of our business partner, Adidas, the research project we have discussed in this paper began one step further back, with the business climate that generated the need for cooperation. Adidas was driven to experiment with a more cooperative strategy by increasingly sophisticated customers, many of whom were making life-style rather than utilitarian purchases, and by increasingly aggressive competitors whose activities were accelerating customer demands. The diversification of demand, the increasing speed of demand changes, and the proliferation of choice, was interpreted by Adidas' management as requiring new methods of collaborating with their customers. More specifically, they decided to launch *mi Adidas*, a new offering in which the customer participated in product design.

Drawing on the expanded discussion of absorptive capacity offered by Zahra and George (2002), four challenges summarize our understanding of what is required to benefit from this kind of cooperation:

- The *acquisition challenge* refers to the requirement that the company interested in co-design build an organizational and technical infrastructure that can identify and acquire a new level of information and knowledge from customers. Meeting this challenge requires increasing the basic skills and motivation of employees at the customer interface.
- The *assimilation challenge* addresses the need for routines and processes that allow the firm to connect acquired customer information with other internal routines and processes. Meeting this challenge again depends on the skill level and motivation of the multiple actors who must be involved.
- The *transformation challenge* is to utilize co-design information for building an efficient and customer-centric organization at a strategic level. The test is whether new value is created from the cooperative activity.
- Finally, the *exploitation challenge* is to transform the co-design system into a long-term sustainable business model so that the firm (and ideally its partners) can refine, extend and leverage existing competencies or create new ones over time.

Our data set of 20 cases showed four different modes of organizing co-design as a collaborative effort among suppliers. We explored the strengths and weaknesses of these alternative modes of cooperation from the manufacturers' perspective in the light of the four challenges to absorptive capacity just outlined. Our conclusions, summarized in Table 3, were evaluated and refined in the final step of our research in discussion with managers at Adidas.

The practical result of considering these comparative findings was a significant change in the co-design interface at Adidas and a major investment in implementing this new structure in its mass customization operations. Whether this new customer interaction system is sustainable and profitable in the long term is the subject of a further research project with the company.

Our paper can extend understanding of both collaboration with customers and the inter-organizational cooperation required to achieve it in several ways: from the perspective of practice, the research presented here contributes deeper insight into the challenges of running a co-design system. The insight gained from studying other organizations and evaluating the generic benefits and drawbacks of the different modes of collaboration in a systematic way may serve as a good base for further discussions with retailers as well as manufacturers and intermediaries. We hope these discussions will ultimately improve connections with customers.

Further empirical evaluation of generic modes of collaboration for co-design by academic researchers is also important. For example, we observed mixed forms of collaboration in our study, and are interested in the evolution of cooperative forms over time. It seems clear that cooperation leads to more cooperation. Once a company takes the strategy of increasing cooperation with customers, it appears to start a chain reaction not only within the company, but across companies. We also saw that cooperation tends to generate new competition. While the literature on alliances often observes the risk of partners becoming competitors, our data indicated that this was not the original intent of collaboration initiators. But the failure of required partnership skills did lead initiators to acquire new skills. Further understanding will depend upon cooperative research that not only considers collaborative processes, but their practical and economic outcomes as well.

Finally, we suggest that there are unique benefits from carrying out research on collaboration in collaborative partnerships that unite business and university partners. Each partner brings a unique perspective to the research project. More important, each partner has different interests and values, if these are incorporated in design and analysis, we will be able to generate a more complete picture of collaboration for customer-centric strategy and many other purposes.

Acknowledgements

This research was funded partly by grants from the European Commission (GIRD-CT-2000-00343) and the German Federal Ministry of Education and Research (project EWOMACS). We gratefully acknowledge the feedback of participants in the 'Interactive Branding' track at EURAM 2004 in St. Andrews, UK, and of the 2004 AMA Educators Conference on Relationship Marketing in Dallas, USA. We thank the first editor of this special issue for incredibly valuable feedback, suggestions and comments. All remaining weaknesses are solely the responsibility of the authors.



References

- Agrawal, M., Kumaresh, T.V. and Mercer, G.A. (2001). The false promise of mass customisation. *McKinsey Quarterly*, 38(3): 62–71.
- Ahlström, P. and Westbrook, R. (1999). Implications of mass customization for operations management. *International Journal of Operations & Production Management*, 19: 262–274.
- Belk, R.W., Sherry, J.F. and Wallendorf, M. (1998). A naturalistic inquiry into buyer and seller behavior in a swap meet. *Journal of Consumer Research*, 14: 449–470.
- Berger, C. and Piller, F. (2003). Customers as co-designers: The miAdidas mass customization strategy. *IEE Manufacturing Engineer*, 82(4): 42–46.
- Bettis, R.A. (1991). Strategic management and the straightjacket. *Organizational Science*, 2: 315–319.
- Bowen, D. (1986). Managing customers as human resources in service organizations. *Human Resource Management*, 25: 371–383.
- Cohen, W.M. and Levinthal, D.A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35: 128–152.
- Daft, R.L. and Lewin, A.Y. (1990). Can organization studies begin to break out of their normal science straitjacket. *Organization Science*, 1: 1–9.
- Danneels, E. (2003). Tight-loose coupling with customers: The enactment of customer orientation. *Strategic Management Journal*, 24: 559–576.
- Day, G.S. (1994). The capabilities of market-driven organization. *Journal of Marketing*, 58(10): 37–52.
- De Meyer, A., Dutta, S. and Srivastava, S. (2002). *The bright stuff: How innovative people and technology can make the old economy new*. London: Prentice-Hall.
- Duray, R. (2002). Mass customization origins: Mass or custom manufacturing? *International Journal of Operations & Production Management*, 22: 314–330.
- Eisenhardt, K.M. (1989). Agency theory: An assessment and review. *Academy of Management Review*, 14: 57–74.
- Fowler, S. et al. (2000). Beyond products: New strategic imperatives for developing competencies in dynamic environments. *Journal of Engineering and Technology Management*, 17: 357–377.
- Franke, N. and Piller, F. (2003). Key research issues in user interaction with configuration toolkits in a mass customization system. *International Journal of Technology Management*, 26: 578–599.
- Franke, N. and Piller, F. (2004). Toolkits for user innovation and design: An exploration of user interaction and value creation. *Journal of Product Innovation Management*, 21: 401–415.
- Gibbons, M. (1994). *Innovation and the developing system of knowledge production*. Trinitational Summer Institute on Innovation, Competitiveness, and Sustainability in North America, August 14–20.
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. and Trow, M. (1994). *The new production of knowledge. The dynamics of science and research in contemporary societies*. London: Sage.
- Gummesson, E. (2000). *Qualitative methods in management research*, 2nd edn. London: Sage.
- Gummesson, E. (2002). *Total relationship marketing*, 2nd edn. Oxford: Butterworth-Heinemann.
- Hauschildt, J. and Grün, O. (1993). Auf den weg zu einer realtheorie der unternehmung. In J. Hauschildt and O. Grün (eds.) *Ergebnisse empirischer betriebswirtschaftlicher Forschung: Zu einer Realtheorie der Unternehmung*. Stuttgart: Schäffer-Poeschel, pp: IX–XII.
- Hirschman, E. (1986). Humanistic inquiry in marketing research. *Journal of Marketing Research*, 23: 237–249.
- Homburg, C. (2000). *Kundennähe von Industriegüterunternehmen*, 3rd edn. Wiesbaden: Gabler.
- Homburg, C., Workman, J.P. and Jensen, O. (2000). Fundamental changes in marketing organization: The movement toward a customer-focused organizational structure. *Academy of Marketing Science Journal*, 28: 459–478.
- Huff, A.S. (2000). Changes in organizational knowledge production, 1999 Presidential Address. *Academy of Management Review*, 25: 288–293.
- Huff, A.S. (2002). *What is the future of management education?* 2nd annual conference of the European Academy of Management, May 9–11, Stockholm, Sweden.
- Huff, A.S. and Huff, J.O. (2001). Re-focusing the business school agenda. *British Journal of Management*, 12: S49–S54.
- Huffman, C. and Kahn, B. (1998). Variety for sale: mass customization or mass confusion. *Journal of Retailing*, 74: 491–513.
- Khalid, H.M. and Helander, M.G. (2003). Web-based do-it-yourself product design. In M. Tseng and F. Piller (eds.) *The customer centric enterprise: Advances in mass customization and personalization*. New York, Berlin: Springer, pp: 247–266.
- Köhler, R. (1977). *Empirische und handlungstheoretische Forschungskonzeptionen in der Betriebswirtschaftslehre*. Stuttgart: C.E.Poeschel.
- Koller, H. (2000). *Führung von Unternehmen im Spannungsfeld zwischen Autonomie und Integration* Habilitation, TUM Business School, Munich 2000.
- Kotha, S. (1995). Mass customization: Implementing the emerging paradigm for competitive advantage. *Strategic Management Journal*, 16(special issue): 21–42.
- Kotler, P. (1989). From mass marketing to mass customization. *Planning Review*, 17(5): 10–13.
- Kubicek, H. (1977). Heuristische bezugsrahmen und heuristisch angelegte forschungsdesigns als elemente einer konstruktionsstrategie empirischer forschung. In R. Köhler (ed.) *Empirische und handlungstheoretische Forschungskonzeptionen in der Betriebswirtschaftslehre*. Stuttgart: C.E.Poeschel, pp: 3–36.
- Langlois, R.N. and Cosgel, M. (1996). *The organization of consumption*. Working paper no. 1996–07, University of Connecticut, Department of Economics, Storrs, CT (published in M. Bianchi (ed.) *The active consumer: Novelty and surprise in consumer choice*. New York: Routledge, pp: 107–121.
- Langlois, R.N. and Robertson, P. (1995). *Firms, markets, and economic change: A dynamic theory of business institutions*. London: Routledge.
- Lee, C.-H.S., Barua, A. and Whinston, A. (2000). The complementarity of mass customization and electronic commerce. *Economics of Innovation & New Technology*, 9(2): 81–110.
- Lengnick-Hall, C. (1996). Customer contributions to quality: a different view of the customer-oriented firm. *Academy of Management Review*, 21: 791–824.
- Milgrom, P. and Roberts, J. (1990). The economics of modern manufacturing: technology, strategy, and organization. *American Economic Review*, 80: 511–528.
- Mintzberg, H. (1994). *The rise and fall of strategic planning*. New York: Free Press.
- Möslein, K. (2005). *Der Markt für Managementwissen*. Wiesbaden: Gabler.
- Normann, R. and Ramirez, R. (1993). From value chain to value constellation: Designing interactive strategy. *Harvard Business Review*, 71(4): 65–77.
- Normann, R. and Ramirez, R. (1998). *Designing interactive strategy: From value chain to value constellation* (revised reprint). New York, Chichester: Wiley, (original edition: 1993).
- Ödman, P.-J. (1985). Hermeneutics. In T. Husen and N. Postkethwaite (eds.) *The international encyclopedia of education*. Oxford, UK: Pergamon, pp: 2162–2169.
- Pfeffer, J. and Salancik, G.R. (1978). *The external control of organizations: A resource dependence perspective*. New York: Harper & Row.
- Piller, F. and Stotko, C. (ed.) (2003). *Neue wege zum innovativen produkt*. Düsseldorf: Symposion.
- Piller, F. and Tseng, M. (2003). New directions: future challenges for mass customisation. In M. Tseng and F. Piller (eds.) *The customer centric enterprise: Advances in mass customization and personalization*. New York, Berlin: Springer, pp: 519–533.
- Piller, F. and Müller, M. (2004). A marketing approach for mass customization. *International Journal of Computer Integrated Manufacturing*, 17: 583–593.
- Piller, F. (2003). *Mass customization*, 3rd edn. Wiesbaden: Gabler.
- Piller, F. (2005). *Innovation and value co-creation*. Hong Kong, Munich: IIMCP Press (forthcoming).
- Piller, F., Möslein, K. and Stotko, C.M. (2004a). Does mass customization pay? An economic approach to evaluate customer integration. *Production Planning & Control*, 15: 435–444.
- Piller, F., Schubert, P., Koch, M. and Möslein, K. (2004b). *From mass customization to collaborative customer co-design*. Proceedings of the ECIS 2004 Conference, June, Finland.
- Piller, F., Schubert, P., Koch, M. and Möslein, K. (2005). Overcoming mass confusion: Collaborative customer co-design in online communities. *Journal for Computer Mediated Communication* (in print).
- Piller, F., Reichwald, R. and Schaller, C. (2003). Building customer loyalty with collaboration nets: Four models of individualization based CCRM. In Quinn Mills et al. (eds.) *Collaborative customer relationship management*. Berlin, New York: Springer, pp: 133–154.

- Pine, B.J. (1993). *Mass customisation*. Boston, MA: Harvard Business School Press.
- Pine II, B.J., Peppers, D. and Rogers, M. (1995). Do you want to keep your customers forever? *Harvard Business Review*, 73: 103–114.
- Prahalad, C.K. and Ramaswamy, V. (2004). *The future of competition: Co-creating unique value with customers*. Boston, MA: Harvard Business School Press.
- Ramirez, R. (1999). Value co-production: intellectual origins and implications for practice and research. *Strategic Management Journal*, 20: 49–65.
- Reichwald, R. (2004). Organisationsgrenzen. In G. Schreyögg and A. von Werder (eds.) *Handwörterbuch unternehmensführung und organisation (HWO)*, 2nd, 4th edn. Stuttgart: Schäffer-Poeschel, pp: 998–1008.
- Reichwald, R., Piller, F.T. and Möslin, K. (2000). *Information as a critical success factor for mass customization, or: Why even a customized shoe not always fits*. Proceedings of the ASAC-IFSAM 2000 Conference (Marketing Track), 9–12 July, Montreal, Quebec, Canada.
- Reichwald, R. and Siebert, J. (2004). *Benchmarking study on design, management, and controlling of corporate universities*. Final project report, TUM Business School, Munich.
- Rowley, J. (2002). Eight questions for customer knowledge management in e-business. *Journal of Knowledge Management*, 6: 500–511.
- Scott, R.W. (1992). *Organizations: Rational, natural and open systems*. Englewood Cliffs, NJ: Prentice-Hall.
- Seifert, R.W. (2002). *The mi adidas mass customization initiative*. IMD case study POM 249, International Institute for Management Development, Lausanne.
- Seybold, P.B., Marshak, R. and Lewis, J. (2001). *The customer revolution: How to thrive when customers are in control*. New York: Crown Business.
- Sheth, J.N., Sisodia, R.S. and Sharma, A. (2000). The antecedents and consequences of customer-centric marketing. *Journal of the Academy of Marketing Science*, 28: 55–66.
- Shipp, S. (2002). Soul: A book for ‘a few dozen computer scientists’. *Academy of Management Executive*, 16(4): 64–67.
- Sydow, J. and Windeler, A. (1994). *Management interorganisationaler Beziehungen*. Opladen: Westdeutscher Verlag.
- Thomke, S. and von Hippel, E. (2002). Customers as innovators: a new way to create value. *Harvard Business Review*, 80(4): 74–81.
- Tranfield, D. (2002). Formulating the nature of management research. *European Management Journal*, 20: 378–382.
- Tseng, M. and Jiao, J. (2001). Mass customisation. In G. Salvendy (ed.) *Handbook of industrial engineering*, 3rd edn. New York: Wiley, pp: 684–709.
- Van Aken, J.E. (2001). *Management research based on the paradigm of the design sciences: The quest for tested and grounded technological rules*. Working paper, Eindhoven Centre for Innovation Studies, Eindhoven, Netherlands.
- Van de Ven, A.H. (2002). ‘Don’t do longitudinal research’ nonsense. *Academy of Management, Online Discussion Forum*, June 6 (www.aom.pace.edu).
- Vandermerwe, S. (1999). *Customer capitalism: increasing returns in new market spaces*. London: Nicholas Brealey.
- Verona, G., Prandelli, E. and Sawhney, M. (2004). Innovation and virtual environments: Towards virtual knowledge brokers. *Organization Studies*, submitted second revision, October.
- Victor, B. and Boynton, A.C. (1998). *Invented here*. Boston: Harvard Business School Press.
- von Hippel, E. (1998). Economics of product development by users: the impact of ‘sticky’ local information. *Management Science*, 44: 629–644.
- von Hippel, E. (2001). Perspective: user toolkits for innovation. *Journal of Product Innovation Management*, 18: 247–257.
- von Hippel, E. (2005). *Democratizing innovation: Users take center stage*. Cambridge, MA: MIT Press.
- Warner, F. (2001). Girl, interpreted. *Fast Company*, 49: 134–139.
- Wikström, S. (1996a). Value creation by company-consumer interaction. *Journal of Marketing Management*, 12: 359–374.
- Wikström, S. (1996b). The customer as co-producer. *European Journal of Marketing*, 30(4): 6–19.
- Wise, R. and Baumgartner, P. (1999). Go downstream: The new profit imperative in manufacturing. *Harvard Business Review*, 77(5): 133–141.
- Witte, E. (1968). Die organisation komplexer entscheidungsverläufe. *Zeitschrift für betriebswirtschaftliche Forschung*, 20: 581–599.
- Witte, E. (1977a). Lehrgeld für empirische forschung, notizen während einer discussion. In R. Köhler (ed.) *Empirische und handlungstheoretische Forschungskonzeptionen in der Betriebswirtschaftslehre*. Stuttgart: Schäffer-Poeschel, pp: 269–281.
- Witte, E. (1997b). Feldexperimente als Innovationstest – Die pilotprojekte zu neuen medien. *Zeitschrift für betriebswirtschaftliche Forschung*, 49: 419–436.
- Yin, R.K. (1994). *Case study research: Design and methods*, 2nd edn. Thousands Oaks, CA: Sage.
- Zahra, S.A. and George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review*, 27: 185–203.
- Zipkin, P. (2001). The limits of mass customisation. *Sloan Management Review*, 42(3): 81–87.

UNCORRECTED