FOUR TYPES OF MASS CUSTOMIZATION: STRATEGIES TO SERVE CUSTOMERS INDIVIDUALLY WITH MASS PRODUCTION EFFICIENCY

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ABSTRACT

Enterprises in all branches of industry are being forced to react to the growing individualization of demand; yet, at the same time, increasing competitive pressure dictates that costs must also continue to decrease. Companies have to adopt strategies which embrace both a closer reaction to the customers' needs and efficiency. Mass Customization meets this challenge by offering individually customized goods and services at mass production efficiency.
However, while Mass Customization has already been discussed in the literature for more than a decade, increased practical implementation of this strategy can been found in business only within the last years. This time lag may be explained by the fact that only since few years sufficient technologies exist to handle the information flows connected with mass customization. Especially as mass customization enters more and more consumer markets, new Internet technologies can be seen as its main enabler. To connect strategies discussed in e-business with the field of mass customization, the paper deploys a structural approach to structure different strategies to manage mass customization successfully.
The paper ends with a brief discussion of some of the myths of mass customization, hindering companies to reach the full benefits of the concept. These myths are based on a common misunderstanding of mass customization.

KEYWORDS

Individualization, mass customization, mass customization strategies, mass customization myths, mass customization information cycle, mass customization concepts

1. Individualization, competitive pressure, and mass customization

„It is the customer who determines what a business is." In the very sense of Drucker's (1954) analysis, the single customer has come more deeply into the firm's focus than ever. Firms are faced by an uninterrupted trend towards individualization in all areas of life, as new Delphi studies predict. Explanations may be found in the tendency towards an experience economy, the growing number of single households, an orientation towards design and, most importantly, a new awareness of quality and functionality which demands durable and reliable products corresponding exactly to the specific needs of the purchaser. In particular, consumers with great purchasing power are increasingly attempting to express their personality by means of an individual product choice (an example is BMW's new „Individual Program" which emphasizes the fulfillment of individual fittings and equipment). Thus, many suppliers are forced to create product programs with an increasing wealth of variants right down to the production of units of one (differentiation by means of variety). In the final consequence, many companies have to process their customers individually (Glazer, 1999; Kahn, 1998; Piller/Müller/Reichwald, 2004; Tseng/Piller, 2003).
Traditionally, the objective of customizing goods and services is to attain increased revenue by the ability to charge premium prices derived from the added value of a

solution meeting the specific needs of a customer (Porter, 1980). However, the present competitive situation of many industries prevents the company from reacting by a strategy of differentiation. The cost-benefit relation alters because buyers demand relatively high standards of quality, service, variety or functionality even when the sales price is favorable or, vice versa, suppliers have to meet additional requirements in pricing when a product is marketed differentiated.

Companies operating successfully under this condition have to start out from both the cost as well as the differentiation position at the same time. However, this is in conflict with the classical generic competitive strategies according to Porter (1980) – i.e. differentiation, cost leadership, and focus strategies – which became the precepts on which countless companies based their operations (Kotha, 1995). In his conception, Porter follows the fundamental postulate of the incompatibility of differentiation and cost leadership. A company must clearly decide on one type of strategy, otherwise it runs the risk of getting "stuck in the middle" (Porter, 1980: p. 16). While this conception became widely accepted among scholars and managers alike, empirical studies (e.g. Kekre/Srinivasan, 1990; Miller/Dess, 1993; Reitsperger et al., 1993) and a detailed theoretical argumentation (e.g. Faulkner/Bowman, 1992; Hill, 1988; Murray, 1988; Piller, 2003) demonstrate that competitive strategy does not necessitate choosing between cost leadership and differentiation. Rather the simultaneous attainment of both strategic positions should be pursued within the context of a hybrid competitive strategy.

The practical implementation of hybrid competitive strategies is based on the potential offered by new technologies in manufacturing and information management. At the time Porter's conception came about, process technologies that are now perfected were only in the stage of development. New manufacturing technologies (computer-integrated production and flexible manufacturing systems) reduce the trade-off between a wide range of variants (flexibility) and production cost (productivity). But in many cases the essential prerequisite for the implementation of a hybrid strategy is the electronic networking of purchasers and producers as well as the suppliers involved. Adequate technologies are available nowadays with the Internet and its sub-technologies (like SCM, XML, VPN and so on).

Precisely this combination of strategic challenges and new technological possibilities is the driver of mass customization. While Davis coined the term in 1987, the concept attained wide popularity with Pine's (1993) book. In the mass customization concept, goods and services are produced to meet individual customer’s needs with near mass production efficiency (Piller, 2003; Piller/Stotko, 2003; Reichwald/Piller/Tseng, 2003; Tseng/Jiao, 2001). Mass customization means the production of goods and services for a (relatively) large market that exactly meets the needs of every individual demander with regard to certain product characteristics (differentiation option) at costs roughly corresponding to those of standard mass-produced goods (cost option). The information collected in the course of the process of individualization serves to build up a lasting individual relationship with each customer (relationship option). (For an overview of the three options of mass customization see Figure 1) In order to focus the discussion, the remaining paper concentrates on the mass customization of goods (and not services). Further, the term ‘customer’ always refers to the end customer, i.e. the consumer or user of the customized product.

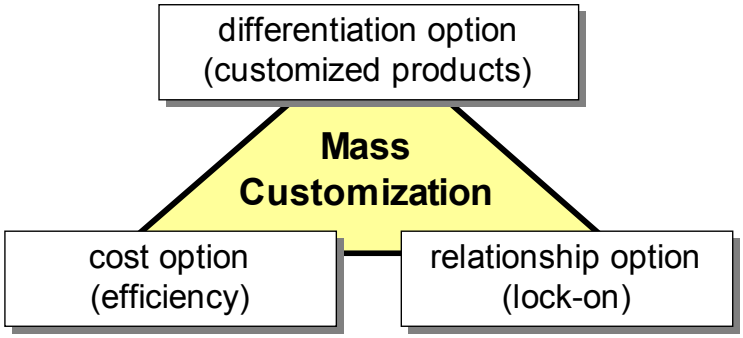


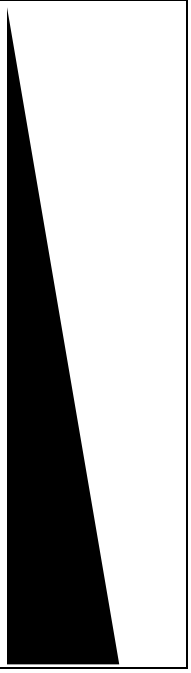
Fig. 1: The three levels of mass customization

Company	Products	Markets
Cove (www.cove.com)	men's (formal) wear	Germany
Selve (www.selve.net)	women shoes	Germany
Customatix (www.customatix.com)	fashion shoes	USA
Dell Computers (www.dell.com)	PCs	world wide
Factory121 (www.factory121.com)	watches	world wide (major markets are Switzerland, France, Germany, UK, USA)
Interactive Custom Clothes Company Designs (www.ic3d.com)	jeans	USA
Lands' End (www.landsend.com)	khakis (trousers)	USA
Lego (www.lego.com)	comics, special toy kits (Mosaic product line)	world wired (major markets are USA, Canada and Germany)
miAdidas (www.miadidas.com)	sport shoes (soccer, running, basketball)	Germany, UK, Netherlands, Italy, Japan, Korea, USA
M&M Chocolates (www.colorworks.com)	Packaging of chocolates	USA
NikeID (www.nike.com)	sport shoes (design)	USA, Germany, Japan
Reflect.com (www.reflect.com)	cosmetics and body care	USA
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

Fig. 2: Some examples of mass customization

Mass Customization is nowadays lived and practiced by many firms from various industries (see Figure 2). The implementation of mass customization takes place by means of various methods, which combine different options for customization while maintaining the cost option (similar classifications are described by Gilmore/Pine, 1997; Lampel/Mintzberg, 1996; McCutcheon et al., 1994; Piller/Schoder, 1999; Pine, 1993; Robertson/Ulrich, 1998). Figure 3 shows that modularization (platform thinking) can be regarded as the central principle of mass customization (Feitzinger/Lee, 1997; Pine, 1993:196-212; Sawhney, 1998): "A product with a modular design provides a supply network with the flexibility that it requires to customize a product quickly and inexpensively" (Feitzinger/Lee, 1997: p. 117). A relatively high level of prefabrication

permits scale-oriented basic production whose results (modules) are combined or completed in the final steps of production according to a specific customer order.

Soft Customization: *Customization based on fully standardized manufacturing processes*	***Hard Customization:*** *Customization starts within the manufacturing processes*	Degree of customer specific activities of the value chain
Self customization create customizable products and services *Microsoft Office, Aveda Personal Blends, Lutron Electronics*	**Customization-standardization-mix** either the first or the last activities of the value chain are customized within the factory, while keeping the others standardized *Original Spin(Levi Strauss), IC3D, Selve, Cove, Lands'End*	
Point-of-delivery customization customization of a standardized product at the point-of-delivery *Paris Miki, Dynafit and Nordica ski shoes, M&M Colorworks*	**Modular product architectures** modularize components and combine them to customized products *MiAdidas, Dell, Selve, Factory121, Customatix, Lego, NikeID*	
Service customization customize services around standardized products and services *1-800-Birthday, Hertz Gold Club, Lego*	**Flexible customization** using flexible manufacturing systems for production of fully customized products without higher costs *Sovital, Reflect*	

For more examples of mass customization see www.mass-customization.de; for a detailed description of various case studies see Piller/Stotko, 2003 (www.mass-customization.de/ibook.htm)

Fig. 3: Methods for achieving mass customization: soft customization versus hard customization

From a strategic point of view, mass customization means differentiation through customization, i.e. the production of goods in so many variants that the wishes of each relevant customer are fulfilled. While most variety strategies assume that goods are produced in advance for defined market niches and placed in inventory for some anonymous customer, a mass customized product is manufactured individually for an identified customer after the order has been received. The demand for a relatively favorable cost level constitutes the cost option of mass customization. A customized product can lead to lower costs when a combination of economies of scale and economies of scope is attained („economies of integration“, Noori, 1990). The differentiation option leads to greater product attractiveness. In addition, the individual contact between supplier and customer offers possibilities of building up a lasting relationship with the customer ("learning relationships", Peppers/Rogers, 1997).
Once the customer has successfully purchased an individual item, the knowledge acquired by the supplier during the product configuration represents a considerable barrier against switching suppliers. Even if a competitor possesses the same mass customization skills and even if he offers a lower price, a switching customer would have to go again through the procedure of supplying information for product customization. Also, she is once again faced with uncertainties in regard to the quality and the producer's behavior. As these two factors lead directly to an increase in sales,

production volumes are increasing, too – the basis of economies of scale –, while modular product architectures allow firms to attain economies of scope.
At the same time, the individual production of goods results in economies of efficiency (better planning conditions, reduction of fashion risks, reduction of stock keeping of goods for distribution, see Piller/Möslein/Stotko, 2004 for a detailed discussion). When the information acquired by the company about its various customers is aggregated and compared, customer behavior becomes transparent (Kotha, 1995). New customers can be served better and more efficiently, because they are offered an individual product variation which other customers with a similar profile have already purchased in the past ("profiling"). In addition, the broad information basis allows firms to cut back on pools of fixed costs that came about due to the necessity of maintaining a high level of operational flexibility.

2. Enabling Technologies for Mass Customization

Until today, mass customization is connected closely to the potential offered by new manufacturing technologies (CIM, flexible manufacturing systems) reducing the trade-off between variety and productivity (Ahlström/Westbrook, 1999; Anderson, 1997; Kotha, 1995; Pine, 1993; Rautenstrauch, 1997; Schenk/Seelmann-Eggebert, 2003; Tseng, 1997; Victor/Boynton, 1998; Zipkin, 2001). However, we want to argue that information shall be regarded as the most important factor for the implementation of mass customization. „Being truly customer focused is not possible if the organization is not, first, information intensive“ (Blattberg/Glazer, 1994). As shown in Figure 3, there are different conceptions to implement mass customization with diverse demands on production, all methods lead towards a sharp increase in the amount of information and communication necessitated among those involved. Mass customization is successful only when it can cover this need for information and communication both purposefully and efficiently.
The reason for this information richness is based – in comparison to the traditional push-system of mass production – on the need for direct interaction between the customer and seller for every single transaction, a mechanism that will be discussed more detailed at the end of this paper. Every order implies coordination about the customer specific product design as a result of the divided construction process of mass customization (Hibbard, 1999). While the product architectures and the range of possible variety are fixed during a preliminary design process the second step takes place in close interaction between the customer and the supplier. The individual wishes and needs of each customer have to be transformed to a unique product specification. The costs arising from customization consist largely of information costs. They are accounted for by the investigation and specification of the customers' wishes, the configuration of individual products, the transfer of the specifications to manufacturing, an increased complexity in production planning and control, the coordination with the suppliers involved in the individual prefabrication, and the direct distribution of the goods. All theses activities are characterized by high information intense compared to traditional mass production. Thus, customer-related value added is produced on the information level.
The importance of information processing for mass customization may explain the observation that most prominent examples of mass customization were founded just within the last couple of years – although the concept has already been discussed in management literature for more than a decade (e.g. Davis, 1987; Kotler, 1989; Pine;

1993; already Toffler, 1970 described the basic idea). Explanation for that time lag may be found in the fact that only within the last years sufficient technologies exist to handle the information flows connected with mass customization. In former times, firms reduced the information content of their processes in order to reach cost efficient outputs. But today the opposite can be true: An increasing information richness of products and processes guarantees its cost efficient and individualized production. This is possible through the potentials of new information technologies (Wigand/Picot/Reichwald, 1997).

Especially as mass customization enters more and more consumer markets, new Internet technologies can be seen as its main enabler. While in business-to-business markets personal sale and configuration is common, in consumer markets the interaction often has to be fulfilled over the Internet. Web-based interaction tools like product configurators allow to „outsource" the time- and cost-consuming configuration process to the customer. For low cost consumer goods extensive sales and configuration processes cannot be fulfilled by personal sales in a retail outlet – if keeping the cost option of mass customization in mind. Customized cosmetics like reflect.com with a retail value of 10 € cannot be sold in traditional channels. The same is true for many other mass customized products with a relatively small margin. Therefore, mass customization can be seen closely related to e-business and new possibilities connected with the Internet economy. The use of the Internet as a communication medium facilitates the efficient production of customized goods as well as the personalization of customer relationships (Duray et al., 2000; Fulkerson/Shank, 2000; Lee/Barua/Whinston, 2000; Reichwald/Piller/Möslein, 2000b; Zerdick et al., 2000).

3. The Information Cycle of Mass Customization

Our research showed that companies pursuing mass customization successfully integrate a variety of important tasks (for the empirical word building the background for this paper see Piller, 2003; Piller/Stotko, 2003; Reichwald/Piller/Moeslein 2000a, 2000b). They build an integrated information flow – that not only covers one transaction but also uses information gathered during the fulfillment of a customer-specific order to improve their knowledge base. The representation of these processes and of the tasks described before in an information cycle model shall stress the importance of an interconnected and integrated flow of information (see Figure 4).

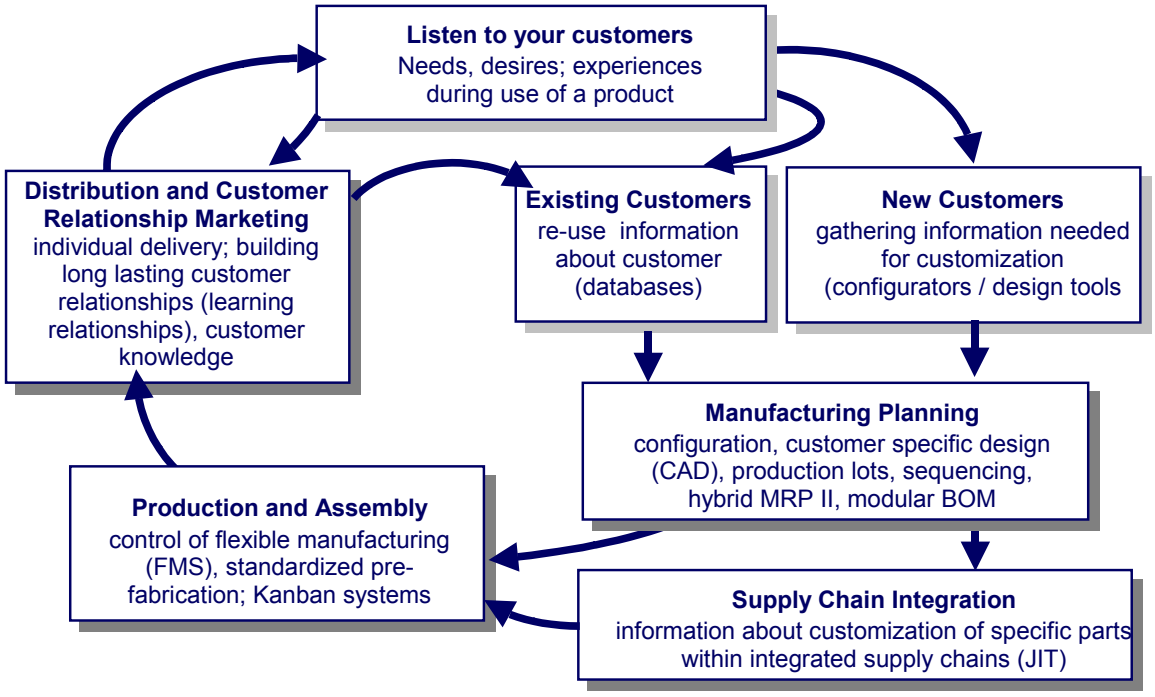


Fig. 4: The information cycle of mass customization

1. Listen to your customers: The cycle starts with the individual needs of each customer. The center of each mass customization program has to be information about the desires of a customer group regarding the product. Although a major meaning of mass customization is that a mass customizer doesn't fulfill every wish of its customers (that would be traditional customization at premier prices), it is important to listen carefully to prospective customers to design a set of product variants and individualization options that on the one hand side has enough possibilities for customization, but that on the other hand is as easy as possible in order to reduce complexity – a main cost driver of mass customization.

2. Configuration: Here the task is to transfer the customers' wishes in concrete product specifications. This is one of the most critical parts of any mass customization business. It's important to differentiate between old and new customers. For new customers, first a general profile of their desires and wishes has to be built up. This profile is transformed into a product specification. At this stage new technologies like recommendation engines provide help. For the configuration for regular customers the existing customer profile has to be used. The old configuration may be presented and customers just asked for variations. The second and all following sales have to be as easy (time- and money-saving) as possible. This is one of the major possibilities to built-up customer loyalty. Leading companies have implemented strong instruments to build trust and show reliability in order to reduce the risk seen by prospective customers in mass customization processes ("configure your own design, pay first, wait, and then hope, that our product fit", a sales manager described the transaction process from a customer's point of view). New research by Mandel/Johnson (1999) demonstrates strong possibilities to influence the users of a Web-site by screen design. These findings have to be used to develop „trust-full" Web-sites.

3. Manufacturing planning: Often already during step 2 the configuration is checked in production planning to get customer specific dates for delivery. After an order is placed, it is transferred into specific manufacturing tasks. Scheduling activities follow. The production tasks are transferred to the responsible process units, whereby suppliers may be integrated in the customization of some parts, too. Note that there shall be no step back to the configuration process after the order was placed. This time- and money-consuming iterative re-configuration has to be eliminated in a successful mass customization concept.
4. Production and supply chain integration: Up to this point, the mass customization process is on the information level only. Now manufacturing activities starts. Often in a segmented production layout (one production segment is responsible for some modular product components) the order is fulfilled. During this step information management has to take care that the right specification of an order are at the right work place at the right time. In an advanced mass customization concept, external suppliers may be integrated into the customization process. This allows to extend the economically possible degree of individualization, a speeding up of the processes, and cost savings due to specialization and faster learning effects. Here, too, information activities are in the center. Integrated information flows and shared applications are required to transfer the customer specific information between the factories.
5. Relationship management: After distribution, the relationship building continued that started with the configuration process. Further knowledge about the customers has to be acquired. The information cycle also shows that not only information about the customer but the production process itself has to be collected in a knowledge base to improve efficiency and quality in follow-up business (Peppers/Rogers, 1997). By doing so, not only new and old customers can be served better. Also production planning can be improved continuously (e.g. by better forecasts for the prefabrication of modular components).

4. Systematization of Mass Customization Concepts

While all companies pursuing mass customization successfully have to build an integrated information flow, there is not a single first-best solution for mass customization. We showed already above that there are different approaches to address mass customization. However, this differentiation of mass customization concepts arguments from a totally manufacturing orientated perspective (like all other know structural approaches of mass customization, for an overview see Piller 2003). In the remaining paper, we will present an approach to structure mass customization strategies that addresses two distinctive features of the concept: the interaction with the customer and the importance of information and electronic business. Thus, for four strategic fields can be identified which are presented in Figure 5. The strategic tasks and demands of each of these fields will be discussed in the next chapter. Before we want to have a closer look on the structural variables, the degree of interaction required between the customer and the manufacturer and the degree of digitizability of customized product components.

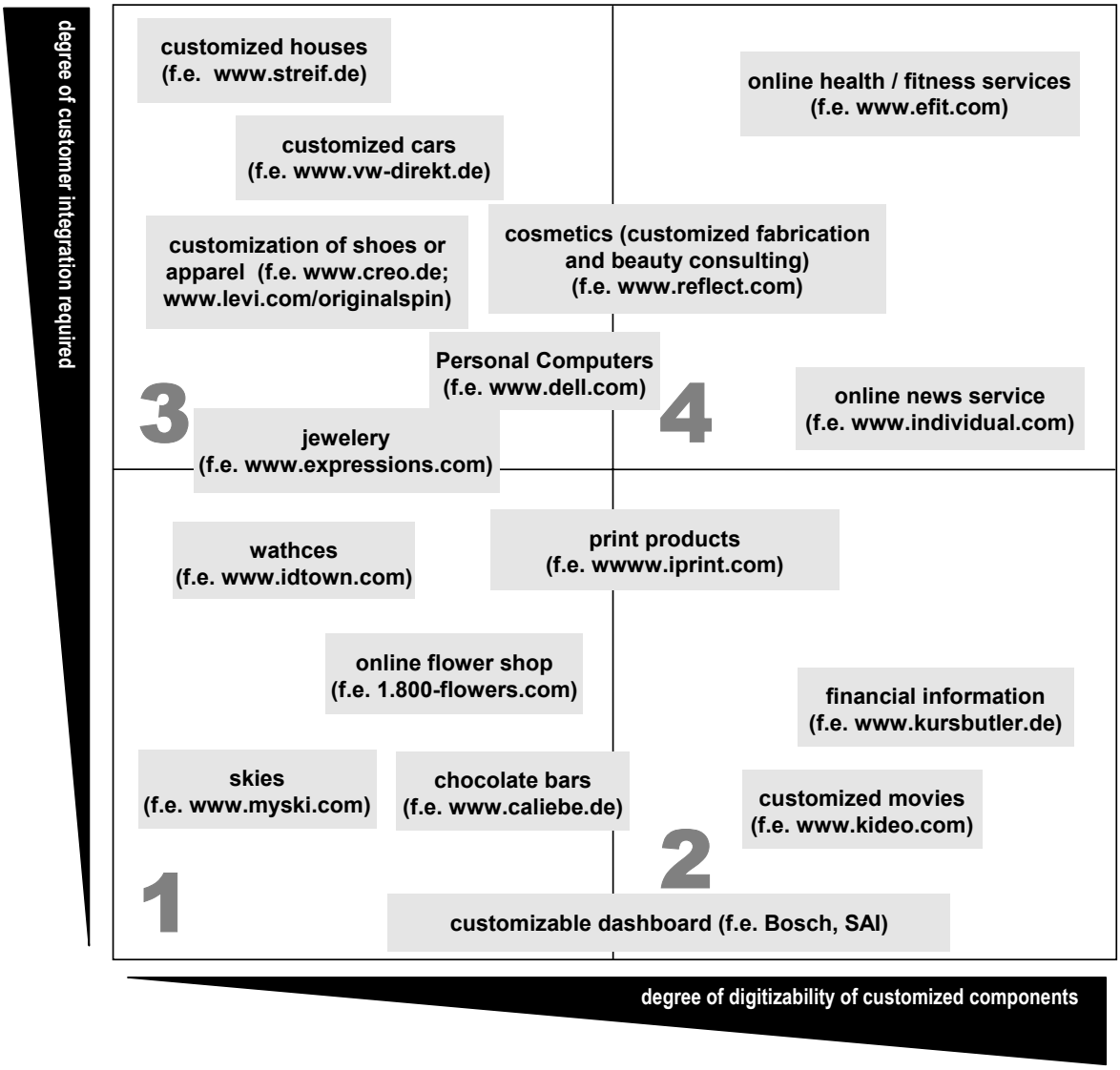


Fig. 5: Mass customization – a structural approach

(1) Degree of interaction required: The integration of the customer into the production process is a distinctive feature of customized production. One can look at the relation between the customer and supplier as a cooperation providing benefits for both sides, but demanding inputs of both participants, too. In mass customization processes, this integration of the customer is required primarily during configuration. The "costs" of this process from the customer's point of view are an important success factor. Especially in consumer markets customers often do not have sufficient knowledge for the definition of the product specification, which corresponds to their needs. As a result the configuration process may last pretty long, and customers may experience an increasing uncertainty during the transaction process. Comparison processes are more difficult because of smaller transparency of supply compared to standardized goods or services. Uncertainty exists, too, about the behavior of the provider. Further, the cooperative character of the configuration results in an asymmetrical distribution of

information – a typical principal agent constellation. Information gaps are increasing the newer and more complex individualization possibilities are. Without a clear reference point for the definition of an optimal performance it is also difficult to judge whether a case of warranty arose.

These uncertainties and factor transfers can be interpreted as additional transaction costs of the customer. One of the most important tasks of the mass customizer it to ensure that the customer's expenditure is kept as small as possible, while the benefit she experiences has to be clearly perceptible (Müller/Piller, 2004). Leading companies of our sample have implemented strong instruments to build trust and reliability in order to reduce the risk seen by prospective customers in mass customization processes. Other instruments minimizing the risk of the customer are warranties or the reputation of the provider. But independent from trust and warranties, the degree of customer integration required into the customization process is positively connected with the expenditures and risk realized by the customer. Thus, the degree of interaction required for customization will not be equal for all products and services. The buyer of a personalized show at NikeID with a purchase price of 50 € will experience smaller complexity of the purchase process than the buyer of a VW sedan, which can be configured and ordered completely without engagement of a dealer on the Web Site of Volkswagen-Direct. Therefore, the characteristics of the product or service being individualized have to be taken into account. Accordingly, the degree of customer integration required is influenced by the relative price of the products and services, the possibility to use instruments to prevent bad investments (e.g. warranties, exchange policy, time of delivery, screening possibilities), the customer's experience with a product (e.g. second buy, product specific knowledge) and its complexity (customization possibilities; product structure). Another point to consider is if the configuration process itself can be regarded as part of the product purchased (configuration as buying experience, leisure activity).

(2) Degree of digitizability: While all mass customized products are characterized by a more or less intense integration of the customer, not all of them can be transferred to an „info sphere" where the customization of products and services can be delivered often very efficiently. The traditional mass producer reduced the information intensity of his products and production processes as far as possible to achieve a good cost position. However, today a fundamental enabler for an economical individualization of products and services is to increase their information intensity. New information technologies allow substituting product functions by information activities. Information richness is a strong indicator for the digitizability of goods and services (Shapiro/Varian, 1998). Digitizability describes the extent in which functions relevant to a customer can be fulfilled by the use of information technology only. For fully digital products modern information technology is the only necessary instrument to deliver customization. These goods can be sold, customized, and distributed over computer networks relatively easily and without high additional costs – often regarded as the "heart" of Electronic Business (Choi/Stahl/Whinston 1997). The degree of digitizability is based on the content of information based components in relation to the whole product or service. While products like newspapers or music can be digitalized totally others like apparel have an information content of zero. But also for these products new Internet technologies facilitate the collection and employment of numerous data concerning the individual customer by permitting interaction between economic units connected via electronic networks.

5. Four Strategies to Create Competitive Advantage with Customized Goods and Services

Based on different combinations of possible degrees of interaction required and digitizability four fields can be derived, representing different business models of mass customization.

(1) Add-on: A first group of rather simple, not complex products and services shows a very small or no degree of digitizability. Also, there is no deep interaction necessary to collect the information required for customization as only few components can be individualized or most customers have enough knowledge about the product so that they can find the sufficient configuration easily and feel no large risk in the buying process. The production of these products is based on the potentials of modern manufacturing and logistics systems. However, the configuration (interaction with the customers) and the planning of the operations are based on integrated information flows. Success factors for these products and services are first integrated information flows connecting the production system with the configuration. Second, the degree of interaction has to be increased in order create a deeper learning relationship with the customer (as long as this can be automated from the supplier's point of view). Therefore, new functionalities or additional online services may be added. By doing so, the degree of digitizability can also be increased by providing easy-to-implement customized services around a (standardized) core product. Although the core product of an online flower shop (just in time delivery of a bouquet) is not digitizable, it differentiates itself from brick-and-mortar stores – and other competitors on the web – in particular through customized services such as a birthday reminder, an address book or a writing program for creative greeting cards.

(2) Attract attention: While the degree of customer integration required is small in this group, customization can be digitized to a large extent. These products and services are information products in the broadest sense that can be sold, customized and delivered via e-business-networks. Customization serves primarily to differentiate a company form its competitors in order to increase customer loyalty. Mass customization can be seen as a strategy to create economics of attention (Goldhaber, 1997; Shapiro/Varian, 1998). Economics of attention are a result from the observation that information is freely available on the Internet while the attention of the users is limited. By increasing the degree of attention, a company shall be able to introduce new products and thus to implement network effects more easily. In this context, mass customization offers an additional way to attract attention based on the incentive of additional customer benefits. While, for example, today some thousand Internet radio stations compete for the attention of the users, imagineradio.com allows its listeners to create their very own radio station playing their preferred music. Here, mass customization serves as a base for new models to create economic value: As the high degree of digitizability makes customization economically feasible, the individualized product or service is often offered free of charge. The objective is to initiate a learning relationship and to gain more information about the individual customer in order to sell either (standardized) products and services fitting to the customized information content or just advertising space on the web site.

(3) Configuration: The third group is characterized by the requirement of an intensive interaction with the customer. An example may be customized apparel where personal measurement activities are necessary during the configuration process. In mass markets,

this has to been done by three-dimensional-scanning devices if a company wants to get reliable measurements economically. But body scanning can not be done online – a personal interaction is needed. The same is true for relatively expensive or complex (from the customer's point of view) products and services, for example the customization of diamond jewelry or buildings. A customer may not have the necessary know-how to define a configuration corresponding to her desires. An intensive interaction is also needed from the seller's point of view in order to create confidence and to minimize the purchase risk. Often a multi-channel sales strategy is recommendable to fulfill the different preferences of diverse customer groups in regard to online literacy, time sensitivity or product knowledge. Several direct and indirect sales forms can be combined – from direct sales by call centers over self-service on the Internet up to brick-and-mortar stores. The task of traditional dealers switches hereby from the selling of a product or service to the configuration support and the consultation of the customer. As often a repurchase based on an available customer profile is handled more economically online, new profit schemes for the dealers have to be established (e.g. a higher initial bonus and smaller additional provisions for every online sale). After configuration, customer data have to be transferred into the producer's business application systems.

While the customization itself is not digitizable, electronic business offers an extensive support of the transaction phase. Companies should try to fulfill as much of the configuration process online, but now (compared to group 1) human advise should be offered by a help or call back button. New Internet technologies offer plenty possibilities – from 3D-pictures of the configured objects up to chat robots allowing a conservation in natural speech. Software tools like recommendation engines simplify the identification of preferences by recording, comparing, and aggregating former sales, pages views or click rates. They enable the direct presentation of individualized content and offer a first suggestion of a configuration by comparing user profiles and indexes of content – even if a user cannot explicitly express her preferences and wishes (Elofson/Robinson, 1998; Shardanand/Maes, 1995). These and other technologies enlarge the range of „configure-it-yourself" to more complex products. Thus, even complex products like houses can be configured and ordered online today. The saving potential of this process allows German building contractor Streif AG to offer customers a discount of 25 000 € if they configure and order their house online (www.streif.de). The use of these technologies has to be guided by the strong necessity to show reliability and to build trust to reduce the purchasing risk from the customer's point of view. New research by Mandel/Johnson (1999) demonstrates strong possibilties to influence the users of a web site by screen design. These findings have to be used to develop „trust-full" web sites. The whole configuration and interaction process – either online or offline – has to differentiate between old and new customers. For new customers, a general profile of their desires and wishes has to be built up using the technologies mentioned above. For existing customers the old configuration and information gathered during former transactions have to be used to make all following sales as easy (time- and money-saving) as possible. For example, the last configuration may be presented and customers just asked for variations. This is one of the major possibilities to built-up customer loyalty.

(4) E-Service-Innovations: The fourth group is characterized by a high degree of interaction and digitizability. Examples are information goods like consulting and information services. An online health center may replace the work of (expensive)

wellness consultants and trainers. After an initial health check each day a customized "wellness map" is created and distributed electronically covering a plan for the daily workout, nutrition suggestions and perhaps the calculation of today's bio-rhythm. Users have to report daily several feedback data. Thus these services must offer a high benefit for a customer to make this expenditure worthwhile. The customer interaction serves as an excellent base to establish intensive learning relationships. The mass customizer has to use information about the individual customer to serve her more comfortably (i.e. at smaller interaction expenditure) and to deliver improved personalized content. That's the starting point for new cross-selling activities. The information about the fitness condition of a customer may provide the initial configuration for customized vitamin products or skin treatment (that strong trust and security issues are essential has not be stressed further).

Services of this group offer a substantial potential for price distinction and personalized pricing – one of the major strategies suggested in e-business. This is done normally by versioning, a buyer chooses under different given versions the product version corresponding to her personal ability to pay (Shapiro/Varian 1998). Mass customization allows switching from versioning (selection between fixed, bundled products) to an individual pricing system based on different valued components that can be mixed freely. Beyond that, individualized digital products reduce the incentive for buyers for arbitrage businesses between users that had to pay different prices. A further source of income is the aggregation of the individual customer information to customer know-how, which can be sold as market research to other companies. The customizable news services for music lovers mylaunch.com or the on-line supermarket Peapod have a substantial source of income from this aggregated customer knowledge (reaction to price adjustments, advertising measures, and reaction to new products).

To summarize the discussion up to this point: Often mass customization is discussed in connection with new manufacturing technologies. We argue, however, that it is information that is the main enabler and therefore that it are new information technologies that are the major driver of mass customization. To address this point, we deployed a new approach to structure different concepts of mass customization – all with their own distinctive demands and requirements. This argumentation is summarized in Figure 6.

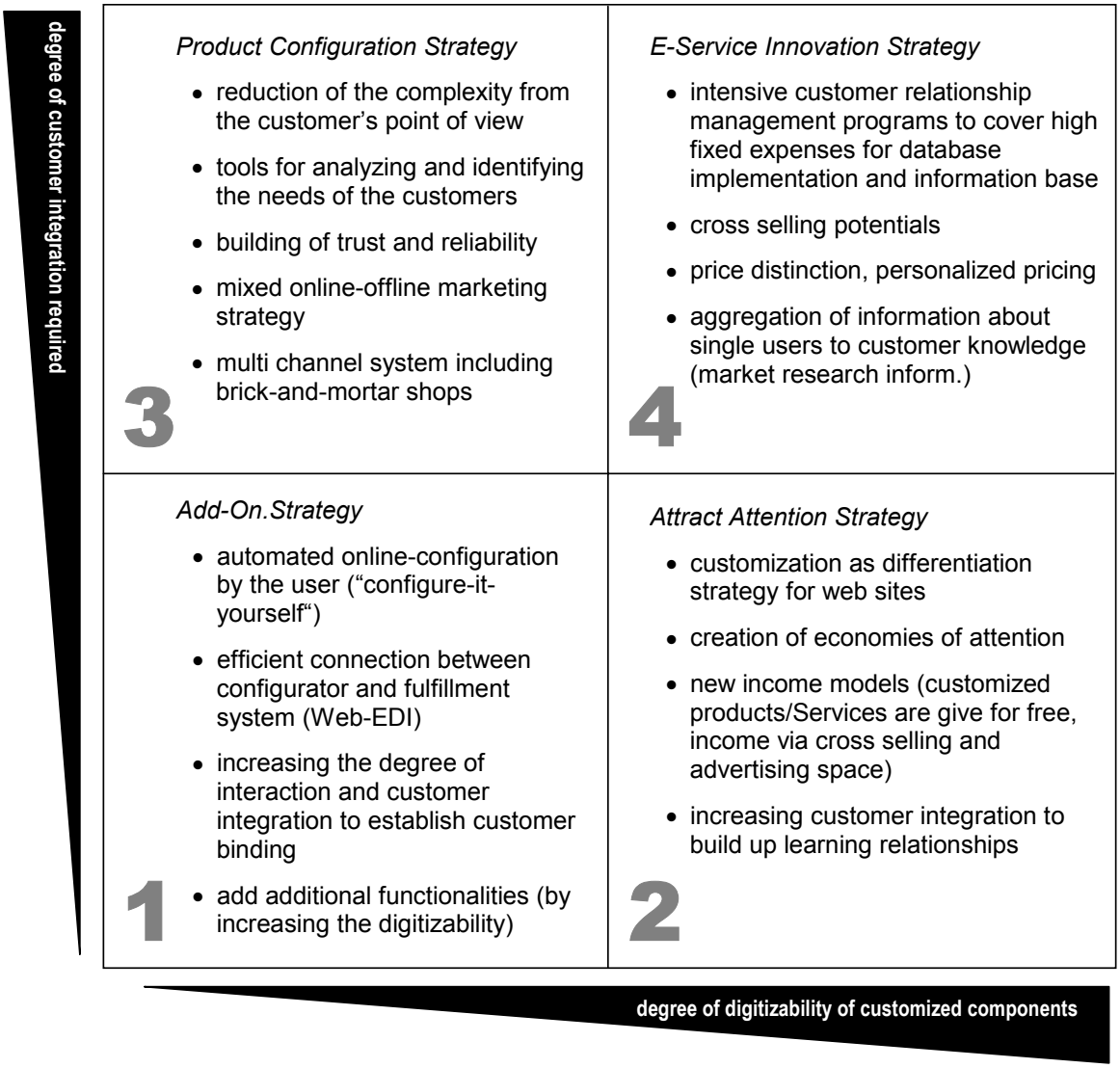


Figure 6: Mass customization strategies

6. Conclusions: The Myths of Mass Customization

The mass customization landscape today reveals a somewhat sobering picture. The opportunities of mass customization are acknowledged as fundamentally positive by theory and empirical studies for many years. They have attained a lot of attention by managers from all kind off industry within the last years. Many companies are already successfully operating after this new business model. Yet the concept of electronic business based on the technological potential offered by new information and communication technologies represents the ideal foundation for providing customized products without a significant increase in costs even in mass markets and for exploiting opportunities to establish profitable long-term customer relationships efficiently. Mass customization must be included to a greater extent as a serious option in corporate strategic considerations in order to meet the new competitive challenges. Likewise, opportunities are being thrown away by companies that, by interpreting mass customization as no more than a new trend that should not be missed, merely provide some of their customer interfaces with a veneer of innovative and individual measures.

In doing so, they fail to change the entire value chain in an integrated manner towards the customer. But only if the information cycle of mass customization will be followed along the whole supply chain network – including the customer –, all the advantages of mass customization will come and stay alive.
While the competitive advantage of mass customization has been widely substantiated in management theory, a deficit exists not only in its empirical examination, but also in analyzing failures of mass customization. Despite a few exceptions, literature about mass customization and personalization is dominated by an argumentation focusing on the benefits of this strategy. However, some prominent failures offer the possibility to study "worst-practices" of mass customization:

- Consider Custom Foot, an US footwear retailer and manufacturer offering customized Italian shoes for men and women for off-the-shelves prices. The company couldn't close the information cycle of mass customization. Its operations failed by an unstructured process chain. Further, the company faced the variety paradox of mass customization and consumer behavior patterns typical for customized production but not considered in Custom Foot's marketing model.

- Or take Get Custom, an US retailer specializing in customized goods. This firm launched its web site with large marketing effort in 2000 but closed operations just after 6 months. Despite the usual e-business start up problems, the company failed to deliver an adequate assortment, over engineered its configuration tools and couldn't manage its cooperation model.

From these and other analyzed failures (see the analysis in Piller/Stotko, 2003), we deploy some of the myths connected with the introduction of mass customization. The following statements are often heard in the discussion on mass customization. But they are myths and alone no success factors of mass customization:
(i) Mass Customization is product based: Often, mass customization is seen as a product based strategy. However, customizing services additional or sublementary to products offers large benefits. Land's End is doing this successfully with its "My Virtual Model" technology, offering a customized shopping experience on the Internet (but since summer 2001, Land's end is a "real" mass customizer, too). On the long term, mass customization concepts including manufacturing offer the larger value – especially if one takes the cost benefits into account coming from a build-to-order approach. But on a short term, a "soft customization" offers plenty of possibilities.
(2) No more brands: Mass Customizer like Reflect.com or myCerial are examples for a often cited trend: With mass customization, the consumer becomes her own brand, creating her own brand personality. But brand names and their owners have a huge capability to overcome the uncertainties and burden the configuration process of mass customization offers. Brands are strong signals that consumers can trust the product concept – remember that they have to pay and wait for something that not exists during the time of purchase. However, brand prepositions have to change from product based concepts to brand names representing the capability of a supplier to offer value to the customer.
(3) Consumers want customization: Consumers want choice. Consumers want individuality. Consumers want customization. Many companies follow these believes. But this is only one part of the truth. Customers are not buying individuality; they are purchasing a product or service that fits exactly their needs and desires. Only few

customers honor long configuration processes. Most users want to find their fitting solution as smooth and simple as possible. Mass Customization concepts based primary on the promise of customization will fail. Successful customizers stress the fit, the functionalities, the smaller costs of ownership and so on – but not customization per se.
(4) Modularity means mass customization: Often, modularity is seen as the key for mass customization. It is true that modular product and service architectures often guarantee mass customization. Complexity related costs and economies of scale and learning result from a strong modular system. But often, many design possibilities and degrees of freedom translate into one term from the perspective of an inexperienced customer: complexity and "mass confusion". Mass Customization is not like „Lego". The toy maker faces today the strong challenge that it's modular system is too complex for most of today's kids. Lego and many mass customization systems lack a good design tool in order to translate the product modularity into needs and wishes of the customer. True, modularity is an important prerequisite for mass customization. But without a strong configuration system that is based not on product architectures but on the customer's needs modularity is useless.
(5) Mass Customizers sell customized products or services: Correct. Mass customizing companies earn their revenue from selling customized products and services. They have a huge possibility to sell even more products due to the possibility to implement a real relationship management system. But wrong, too. From a market perspective, mass customizers are not offering products/services, but the capability to deliver a product just accordingly to a customer's needs and requirements. Offering capabilities is the major "product" of a company pursuing mass customization. The customer becomes a co-designer, using the firm's capabilities to create his own unique solution. The experience of use is supplemented by the experience of innovation (design). Thus, service innovation creating this environment is as important as product innovation. Here, many companies have still their lessons to learn.
So what is our advice at the end? Think twice before entering the mass customization space. It is more difficult as it sometimes appears, as mass customization demands a change along the entire value chain of a firm. And most importantly: The suggestions for action presented by us must not be understand as generic strategic patterns but rather as ideas where a successful mass customization concept can start. Every mass customization strategy has to be customized, too.

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