Mass Customization across the Value Chain

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Abstract: This paper aims at analyzing logistical implications of the introduction of a Mass Customization strategy. Accordingly, several enabling mechanisms of Mass Customization will be pointed out. For this purpose the central question of 'who should be in charge of the customization task' will be reviewed and clarified with regard to logistical parameters like delivery ability, delivery reliability, delivery time, response times to altered order specifications as well as sales planning and forecast uncertainty. In order to identify different decoupling scenarios an extended value chain needs to be put in place as well.
1. Introduction

Introducing the concept of Mass Customization brings about changes to almost every business process of a former mass producer. As opposed to the classical competitive strategies proposed by Porter (Porter 1992) the concept of Mass Customization suggests a solution for an effective value chain by means of active customer integration (Pine 1995, Piller 1998). While many enterprises are beginning to recognize their customers’ desire to buy customized products without being spoilt by choices (Pine 1995), very few did actually understand how to put the concept of Mass Customization (MC) into profit-making practice. Therefore, every company which considers offering customized products has to deliberate about the economic chances and risks involved. Without going into details concerning assessment and rating of risks and the respective means of risk elimination and pooling, every company has to accept that the customers are the major limiting factor in the successful exploitation of Mass Customization (Svensson & Jensson 2003). Even though Mass Customization is commonly perceived as the possibility of balancing costs and the scale of variation it should be kept clearly in mind that every product adaptation has to be of value to the customer. Therefore, variety is only a means and not the end for achieving increased customer satisfaction.

Figure 1: Markets and their applicability for Mass Customization

The most important aspects for customer satisfaction can be identified as a good balance of price and quality and an on-time delivery. Whereas the quality must be defined as: The product characteristics that meet customer expectations. Therefore, the customer satisfaction raises with the decline of the discrepancy of customer preferences and actual available products variants. From here it follows that the market potential of customized goods rises with an increase in the heterogeneity of customer preferences as pointed out in figure 1. Although Mass Customization as a marketing strategy has been known for several years, researchers and industrialists mainly focused on the strategic side of Mass Customization since the biggest obstacles on the move into Mass Customization were suspected here. And still, not every possibility of enabling Mass Customization has yet been looked upon. Along with the first pioneers in Mass Customization new challenges arose in terms of optimizing logistics process structures as well as information and material flows across the value chain. Thus Mass Customization has turned into a holistic logistics process strategy particularly with regard to customer interactivity, configuration and IT tools, product development, PPC and CRM. However, the logistics of materials and information within enterprises and across the value chain has been widely neglected. It is now being examined and adapted in consideration of the special demands made on a value chain by the Mass Customization approach.
In the following, logistical implications of the introduction of a Mass Customization strategy as well as several enabling mechanisms will be pointed out accordingly. For this purpose the central question of ‘who should be in charge of the customization task’ will be reviewed and clarified with regard to logistical parameters like delivery ability, delivery reliability, delivery time, response times to altered order specifications as well as sales planning and forecast uncertainty. In order to identify different decoupling scenarios an extended value chain needs to be put in place.

2. Extended Perception of the Value Chain

The construct of added value originated from the idea of national accounting. In terms of micro-economics, the added value on each single stage of production is commonly defined as the volume of sales less expenses for external labor and material input (Keuper 2002, Reinhard 1997). Thus, the value generated by all business processes of an enterprise within a specific accounting period equals the added value of that period. The traditional value chain is composed of all stages of production and provision of services in which value is added to a product. From the side of the application of income the added value is defined as the amount of all incomes - by name those of employees, public authorities (taxes) as well as that of own and borrowed capital (Berning 2002). Consequently, the income maintenance (added value) is to be the cause and consequence of all business activities.

In terms of introducing a Mass Customization strategy the cause and consequence of all business activities is therefore to meet the individual demands of the customers on a mass market. In contrary to the traditional mass markets, the information concerning product specifications is to be provided by the customers and not to be identified by producers by means of market surveys or the like. By actively providing high quality information concerning product specifications, the customers play an important role in the value chain of the original producer or brand respectively.

Figure 2: Mass Customization value chain

For a general understanding a Mass Customization value chain is shown in figure 2. It is formed by process drivers such as producers, logistics providers, retailers and customers as well as the connection with their respective process elements. Furthermore, the corresponding responsible actors and their activities are referred to. Although all classic value adding stages are included in the model two differences can be identified. Firstly, the value chain is extended by incorporating the customer. Secondly, the task of customization is added which results in the imperative of coping with a lot size of one somewhere in the value chain, although the customization task needs not necessarily to be carried out by the producer as it is shown in figure 2.
3. Customization across the Value Chain

As aforementioned, the original producer does not necessarily have to bear the responsibility for the task of customization, though most often it is referred to as the classic approach to Mass Customization. The responsibility for customization classically refers to the actual action of individualization but is as well closely connected with responsibilities for delivery time, quality and service. The production of individualized elements or the individualization of elements can very well be conducted by other partners within the supply or value chain.

In the following, different scenarios of enabling Mass Customization are developed by shifting the customization responsibility across the value chain. Thereby it is important to notice that in the same manner a brand stays responsible for defaults of any sort in the case of a classic mass production, this responsibility remains for mass customized goods. However the customization responsibility might be shifted on to other partners within the value adding process. That is due to the fact that most customers will hold the brand liable for any insufficiency of a product.

Scenario I

In practical use of Mass Customization however the original producers and owners of brands are responsible for the customization of their products. Although brand owners and producers are often identical they do not necessarily have to be. Branches or even the entire task of production could be separated from the brand-owning company, whereas the former would be outsourced. In this case the responsibility is shifted backwards across the value chain towards the contracted suppliers.

![Figure 3: Customization responsibility shift towards producers](image)

Mostly those enterprises which try to take advantage of the globalization and its assumed merits - global sourcing, focusing on core competencies, reasonable reduction of the vertical range of manufacture and so forth - find themselves in the position of being able to make use of this Mass Customization approach. To different extents, these enterprises have evolved from production into retail companies. Denoting the extreme of this evolvement, these enterprises do not own production capacities any more but bear responsibility for the planning and control of the supply chain as well as for all marketing activities.

The adidas-Salomon AG – which is, according to turnover, the world’s second largest company in the branch of sports goods – is setting a positive example of how this Mass Customization approach can be adopted as it stands. The production sites are mainly located geographically distant to the market. Still the individualized shoes of the mi-adidas brand are all produced and finished in the same contracted factories and send out into the world to the different distribution centers and finally the stores which then get in contact with the customer.
Scenario II

In accordance with the trend towards increasing demands for individual goods, the strategy of postponed manufacturing augmented in importance in order to cope with the increase in complexity of production. Thereby, the decoupling point is shifted forward across the value chain for the purpose of maintaining a standardized and therefore cost effective production as far as possible. Lately, an increasing amount of value added processes is not only postponed but also outsourced as indicated in figure 4. Logistics providers account for a larger proportion of added value within the value chain.

This can include simple customization activities and evolve into the integrated responsibility of planning and control of the supply chain as an outsourced liability. Therefore, the internal as well as external processes of logistics providers have to be reconfigured.

![Figure 4: Customization responsibility shift towards logistics providers](image)

That includes different needs in educated personnel which can be achieved either by educational measures or an adoption of the personnel profile. An implementation of a quality assurance according to the brands requirements as well as an introduction of new services and price structures becomes necessary.

![Figure 5: Basic arrangements of logistics processes](image)

With increased value adding responsibility the cooperation agreements should be adopted to include additional related liability regulations. Basically, three combinatorial
alternatives of arranging the processes of assembly & customization and transportation & distribution can be accounted for as demonstrated in figure 5. The benefit which comes with the parallel arrangement (case a.) of the processes is due to savings in the total time of delivery since the actual transport time is being used for value adding purposes as well. Nonetheless, a reasonable parallel process arrangement can only be achieved, if amongst other restrictions the transport time is relatively long compared to the processing time.

Referring to case b, the decision to have the logistics provider first transport and then assemble or customize products could be driven by reasons of avoiding paying customs, reducing direct and indirect unit labor costs or delaying the date of product customization even more. The latter alternative is put into practice by DHL Danzas and Hewlett Packard whereas DHL Danzas is responsible for transportation and installing country specific software to the hardware produced by Hewlett Packard.

Surveying the overall scenarios I and II-case c not much of a difference can be constituted except for the taking over of the customization task by the logistics provider. Still, transferring this task to the logistics provider is a reasonable decision if the respective processes belong to the core competencies of the logistics provider e.g. providing special or customized packing of goods. If goods are stored by the logistics provider due to e.g. routing and scheduling reasons case c also holds the responsibility for savings across the value chain due to bundle effects.

**Scenario III**

Depending on product complexity and provided technical essentials, the responsibility of customization could be shifted further up the value chain towards the point of sales as shown in figure 6.

![Diagram](image)

**Figure 6: Customization responsibility shift towards points of sales**

The task of actual selling products to the customer has often been identified as the most crucial aspect of the idea of Mass Customization (Svensson & Jenson 2003). Even higher demands concerning strategy and personnel can be expected at the point of sales when the customization task is shifted here, further up the value chain. In order to meet this new challenge, the professional skills of the sales personnel have to be broadened in terms of an adequate technical knowledge of products and handling of technical systems or machines.

Having the product customized in the presence of the customer has not only marketing related advantages as e.g. the rise in customer loyalty and the initiation of copy effects on other customers. In fact, there are products like compound colors that can only be provided to customers in an efficient and cost-effective manner when being customized at the point of sales. Analyzing this approach to Mass Customization it is obvious that the task of customization has to be rather simple and not very time-consuming in order to be easily handled by the sales personnel. Otherwise, the customization task has to be supported by means of technical facilities.
Scenario IV
The approach shown in figure 7 is strongly related to Pines’ ‘adaptive’ Mass Customization approach. According to Pine, adaptive customization means offering a standard but customizable product which is designed in a way that enables users to easily adapt it to their needs (Pine 1997). However, carrying on the idea of adaptation, even self-adaptable products can be designed. A self-adaptable product is characterized by its ability to automatically adjust itself to the person using it. In this regard it is important to distinguish between customers and users. In terms of Mass Customization, the customer is usually referred to as the person using and buying a product whereas the products being associated with this scenario can in fact be used by persons other than the ‘customer’. Due to this distinction scenario IV describes the case of classical Mass Customization as well as the newly deduced case of User Individualization.

Figure 7: Customization responsibility shift towards customers

Either way, a thorough product development and design is required to be able to use the adaptive Mass Customization approach. Yet, it has to be annotated, that very little is known about whether or not and to which extent a specific product could be made self-adaptable. Alongside with software (e.g. Microsoft, SAP, etc.) which needs to be adapted by the customer or user, waterbeds are probably the most prominent example for products which can be assigned to this scenario. In all process elements across the value chain products of this scenario can be handled, planned and scheduled like classic mass products and still the user can appreciate individualization.

4. Discussion
Four different logistical approaches of how to realize Mass Customization strategies across the value chain have been introduced. The respective scenarios and responsibilities for customization are subsumed in figure 8.

From a brand’s point of view, postponed manufacturing is not only concerned with shifting the decoupling point preferably close towards the end of value adding within a process element but rather with shifting the decoupling point preferably close towards the customer and therefore across the value chain.

The respective merits are due to an increase in flexibility of the customer response time, a decrease in the total time-to-customer and an easier determination of the primary (non-allocated) requirements. In particular all value added processes that are executed before customization benefit from a planning reliability which is comparable to that of a mass production scenario since the implementation of the Mass Customization strategy does hardly ever affect them.

However, the scenarios I, II and III have in common that the successful implementation of a Mass Customization strategy still requires the brand or original producer to actively manage the supply and value chain respectively. That implies the brand taking the responsibility for providing not only the customer specifications but also the technical
knowledge to the supply and value chain partners in order to enable them to cope with the new challenges associated with customization and value adding.

<table>
<thead>
<tr>
<th>Scenario I</th>
<th>Scenario II</th>
<th>Scenario III</th>
<th>Scenario IV</th>
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<tbody>
<tr>
<td>Producer is responsible for</td>
<td>Logistics provider is responsible for</td>
<td>Point of sales is responsible for</td>
<td>Customer / User is responsible for</td>
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<tr>
<td>- production</td>
<td>- assembly</td>
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<tr>
<td>- customization</td>
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<td>- product is self-adaptable</td>
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- increasing flexibility of customer response time
- decreasing delivery time (time-to-customer)

Figure 8: Postponing the task of customization

When aiming to exploit the advantages of these scenarios, enterprises are often faced with a limitation in arbitrary parameters from which customers can chose from. In total it can be stated that the further the decoupling point moves up the scale of scenarios the robust becomes a delivery ability of an individualized good. Quality defects on the producer/brand side (i.e. scenario I) do have a higher impact on customer satisfaction when detected at the point of sale or the customer itself than e.g. defects occurring only at the point of sale (i.e. scenario III). Here the reproduction time is very short and the customer can be addressed by educated sales personnel directly. Equally the delivery reliability is predicted to rise and the delivery time predicted to decrease with ascending scenario numbers.

Although the above developed scenarios are fairly abstract they ought to give some clues and pointers of how a Mass Customization strategy could be evolved and introduced as different cases arrive. However, based on a few best practice examples it has been shown that the applicability of the Mass Customization scenarios is not only subject to logistics processes but also product types and attributes. Regarding any of the four Mass Customization scenarios it comes across that is advisable or even mandatory to discuss the possible introduction of Mass Customization with all associated partners at an early stage in order to ensure its success. Mass Customization is in any case an issue concerning the entire supply and value chain.
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