

An Overview of Mass Customization in Practice

by

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1. What is Mass Customization?

Mass Customization (MC), within the marketing, manufacturing, and management contexts of an organization, is the use of flexible, computer-aided manufacturing systems to produce custom outputs in a mass production environment. The main purpose of such a strategy is to combine the low unit costs of a mass production process with the flexibility of individual customization. It allows the customers to interact directly with the producer during the time the product is produced or designed, which allows the manufacturer to satisfy the customer's specific needs that may not be possible with a standard product produced in a mass production environment. The term MC is contradictory because it is based on two opposing concepts: mass production and customization. While mass production implies uniform products, customization means custom outputs to satisfy individual needs (Zipkin, 2001). Let us consider the definition of each of the two terms involved in more details.

Mass production focuses on taking advantage of the economies of scale by offering standardized goods and services. Mass producers can offer low prices because production costs can be lowered by producing homogeneous goods in a large scale. It is considered to be a capital intensive business strategy because it necessitates expensive machinery and, therefore, high fixed and low variable costs. However, the customization concept is derived from the idea of trying to best satisfy customers' needs, without a deliberate emphasis on low prices. Therefore, the term 'mass' implies a relatively high volume of products produced for a mass market while the word 'customization' means that products are designed to fit specific customers' needs (McCarthy, 2004). Instead of producing one standard product for some imagined average customers, mass customization aims to satisfy each customer's unique requirements. Such a strategy is then "a

synthesis of two long competing systems of management: the mass production of individually customized goods and services” (Pine, 1993b).

MC is the result of some fundamental changes that occurred during the last few decades in the business environment and in the development of new manufacturing technologies and strategies. Considering these fundamental factors, McCarthy (2004) defines the term as “the capability to manufacture a relatively high volume of product options for a relatively large market (or collection of niche markets) that demands customization, without tradeoffs in cost, delivery and quality”. However, there are many different kinds of companies and not all of them are going through the same changes at the same rate; which implies that not all of them need to lower costs and increase variety in the same way. Therefore, “even though the essence of mass customization is relatively fixed, at an operational level it will often mean different things to different groups of firms” (McCarthy, 2004). As a result, a variety of approaches to mass customization have been developed by different companies in order to fulfill their specific needs over time.

In order to achieve customization, along with low costs, high quality, and high customer satisfaction, mass customization has to be applied in combination with some relatively new manufacturing concepts, such as Just-In-Time, lean manufacturing, time-based competition, etc.. As Pine (1993b) stated, just-in-time reduces inventory; lean manufacturing eliminates waste, increases process flexibility and responsiveness while also lowering expenses; and made-to-order provides valuable information for customization and also lowers holding costs. Therefore these techniques help increase the flexibility and responsiveness of the process and hence the ability to increase variety and customization without an upward cost pressure. All the benefits derived

from the appropriate implementation of these strategies are essential in achieving low production costs while concurrently customizing the product or service at the same time (Pine, 1993b).

2. Key Elements

In order to succeed as a manufacturing strategy, MC must include three key elements: elicitation, process flexibility and logistics (Zipkin 2001).

a. *Elicitation*

Zipkin (2001) defines elicitation as "a mechanism for interacting with the customer and obtaining specific information". Specifically, its purpose is to determine the exact needs of a customer for a particular product or service. It plays a major role in mass customization because it enables manufacturers to correctly determine what the customers need and what they do not, and customize the product or service accordingly. It needs to be stressed that the process of elicitation takes varying degrees of time and effort depending on the type of product or service and the degree of customization.

b. *Process Flexibility*

In order to satisfy the customers' specific needs, the manufacturing process has to be sufficiently flexible. Without the required flexibility, the product or service will tend to be fairly standard, with little scope for customization. This basic characteristic of mass customization is derived from the craft production system which is completely ignored by the mass production system.

Some of the typical strategies to increase flexibility include modular design, lean manufacturing, and the use of CAD/CAM systems. Zipkin (2001) explains one common way of understanding the flexibility of a process as "determine how many spatial

dimensions are involved in each step". The fewer the number of dimensions involved in a process, the higher is the opportunity for mass customization.

c. Logistics

Effective management of all the necessary resources is critical for any mass customization strategy. Logistics involves the activities needed to ensure adequate supply of raw materials and their storage need; the flow of information through the whole production process; and packaging, storing and delivering the final products. In addition, an efficient logistics system will enable manufacturing and delivering the right product in right quantity at the right time to the right customer. It will also bring about lower inventory, warehousing and transportation costs, resulting in a competitive product price in the marketplace.

3. Four Approaches

According to Gilmore and Pine (1997), there are four main approaches to mass customization: collaborative, adaptive, transparent and cosmetic. They can be applied individually or in any combination with others, depending on the manufacturing and customer requirements.

3.1 Collaborative Approach

The main objective of the collaborative approach is to communicate with the customers to determine what their true needs are and to identify the specific product or service attributes needed to fulfill those needs (Gilmore and Pine, 1997). Furthermore, for such an approach, the customer may take part in the design process, but manufacturing and assembly processes may be

standard while distribution could be customized (Rautenstrauch, Seelmann-Eggebert, and Turowski; 2002).

One well known application is Dell's approach to configure personal computers, where customers work with Dell to identify the components they want in configuring their personal computer (Cohen and Pine, 2007). With the widespread use of the Internet, this approach has been adopted and implemented effectively by other computer manufacturers, such as Sony, Toshiba, Hewlett-Packard, etc. Another example is Paris Miki, the largest Japanese eyewear retailer that allows customers to design their own frames and lenses (Gilmore and Pine, 1997). The customer works with a computerized system until a satisfactory choice is obtained with regard to his or her preferences on lenses, frames, nose bridges, arms, and hinges. Andersen Windows, a window and door manufacturer also uses this approach in that it lets its customers design windows that fit their homes and needs by trying out different styles, shapes, sizes, and colors.

3.2 Adaptive Approach

Sometimes producers offer a great variety of final products for customers to choose from and fulfill their needs. In such cases, it could become difficult for customers to identify the ideal or the best product because it may not include all the desired attributes. Consequently they could wind up choosing a product that may not meet their actual needs.

The adaptive approach offers customers a product that they can customize depending on how they want it to perform under a specific situation. In this approach, all processes are typically standard but the customer can modify the final product according to their needs. (Rautenstrauch, Seelmann-Eggebert, and Turowski; 2002).

One example of adaptive customization is the ‘sleep number bed’ in that each customer buys the same bed but could adjust the firmness of the mattress to meet his or her preference. Also, online learning programs are “... good examples of adaptive customization because they are designed to adjust according to the alternative paths the individual learners take and the varying progress they make, without changing the programs’ infrastructure or platform” (Cohen and Pine, 2007). Another example of this approach is the lighting systems manufactured by Lutron Electronics Company. The system allows the customer to program the lighting system for different effects without having to experiment with different lights and separate switches to create those effects. Software configuration is also an excellent example of this approach because individual users may choose to use the features they need and disregard those they don’t (Rautenstrauch, Seelmann-Eggebert, and Turowski; 2002).

3.3 Cosmetic Approach

As the name implies, in a cosmetic customization approach customers use the product in the same way while it is presented to the customers in different ways (Rautenstrauch, Seelmann-Eggebert, and Turowski; 2002). That is, a standard product is offered in ways that appear to be different to different customers using special packaging, marketing or advertising. Instead of customizing the product or service to meet the needs and desire of different customers, the standard product is packed specially for each customer (Gilmore and Pine, 1997).

The strategy Hertz uses to treat its golden customers is an example of cosmetic customization. Hertz Gold members bypass the check-in counter and go directly to the bus instead, which takes him to the right parking lot with a waiting car. As Cohen and Pine (2007) stated “It’s the same car everyone else in your product class gets, but the delivery of the car is

customized”. The way most soft drink manufacturers market their products also exemplifies this approach. The same product is sold in different containers - aluminum can, plastic or glass bottles, and in different sizes - 12-ounce cans, 20-ounce bottles, 2-liter bottles, etc.

3.4 Transparent Approach

The last category is called transparent customization. With such an approach, the manufacturers or service providers observe the customers’ needs without having a direct communication, but provide the customers the products or services with the specific features they want or need. The customer does not necessarily know that the product or service has been specifically designed for him or her. In fact, transparent customization is the exact opposite of cosmetic customization, which includes a standard content in customized packages (Pine and Gilmore, 1997). The transparent approach works best when individual preferences are easily understood and predicted.

As an example of this approach is the case of ChemStation, a soap manufacturer that develops the right mixture of soap and the right quantity for each specific customer after carefully analyzing their needs. The customers do not know the type of soap they are using or how much is left of it, they only care about the fact that it works and that it is available when needed (Gilmore and Pine, 1997). The Ritz-Carlton hotels also apply the principles of transparent customization by keeping a record of their customers’ personal preferences so they can customize their needs during their future trips (Ho and Tang, 1998). This approach results in a desirable experience for the customer because “the more frequently someone stays in Ritz-Carlton hotels, the more the company learns, and the more customized goods and services it fits

into the standard Ritz-Carlton room, thereby increasing the guest's preference for that hotel over others" (Pine and Gilmore, 1999).

4. Applications of mass customization:

Since the introduction of the concept, mass customization has been applied in various industries and sectors. It has been used as a strategy to tailor products, like clothing and automobiles, and services, like restaurants and hotels, to satisfy customer needs, desires and preferences. In the manufacturing sector, Kotha (1996) studied the application of mass customization in one of Japan's largest bicycle manufacturing facilities, the National Bicycle Industrial Company (NBIC). The author suggests that mass production and mass customization can be applied in conjunction and that it does not have to be one or the other. The author concluded that the application of mass-production and mass-customization in NBIC has led to the creation useful knowledge because highly skilled workers are continuously trained in two different environments, which consequently has led to the development of a very flexible and responsive manufacturing system.

Mass customization applications are also evident in the apparel industry. Lee and Chen (1999) explored how the new technologies and MC strategies have been applied in the apparel industry, and how they have impacted the industry. Specifically, they cite three manufacturers: Custom Foot Inc., Levi Strauss and Second Skin Swimwear, as examples of firms that have successfully combined technology and the MC strategy. Custom Foot Inc., located in Florence, Italy, manufactures customized shoes for their customers. They use a computer scanner that registers information about the customer's feet, and then the customer selects the specific style, material and color from 160 different models. Levi Strauss, using a program called "Personal

Pair,” manufactures custom-fitted jeans for women. Sales person in the store would take measures and enter them into a computer system. The system would suggest some initial test pairs that the customer would try on decide on the needed adjustments. Following the suggestions, Levi Strauss would deliver the final product perfectly customized for the customer.

Second Skin Swimwear practices a mass customization strategy where customers has to first try on some sample suits and then chooses the one he likes the most. A digital camera would then scan the customer’s body, and the customer would select the fabric from a broad range of options. All the information would then be entered into a computer and sent to the manufacturing facility. The customized suit production and its delivery time would be less than two weeks.

Chen and Hao (2007) studied the case of a Chinese restaurant chain with three outlets and 300 different items on their menu. Since its offerings include a high variety of items, the company decided to make some strategic and operational changes. First, it chose to outsource most of the primary handling and some of the semi-processing requirements, which had been previously conducted inside the kitchen. Second, it decided to outsource the seafood inventory in order to improve efficiency and reduce inventory risk. The outsourcing of non-core processes “simplified the operational complexity caused by mass customization and helped the company focus on the core competence: innovation in final cooking and better dinning services” (Chen and Hao, 2007).

Netflix is also a good example of the application of mass customization. The company developed a business model that revolutionized the traditional way of renting movies. It lets their customers browse a huge selection of movies and other DVDs that wouldn’t be available in a normal rental store, which results in customers getting exactly the title they want. In addition, it

has also managed to keep the costs low by targeting a mass market. The success of Netflix stems from the advances in technology and the wide access that people have to the Internet and computers, which has greatly increased in recent years. This would not have been possible twenty years ago and therefore serves to illustrate that technology is a very useful tool for the successful application of mass customization.

Another application of MC can be found in the cell phone industry (Sigala 2006), where the customers are offered a number of service options. For example, in addition to the basic services that every customer needs, others such as various ringtones, voice mail services, text messaging, access to the Internet, etc., are also made available to customize their cell phone services. Monk et al. (2000) explains how MC can be effectively applied in the hospitality industry, which caters to a wide range of customers of varying needs. The customers include those on business trips, pleasure travelers, honeymooners, and vacationing couples with children, all with unique needs. The services can be customized to satisfy their needs with options such as wake-up calls, flexible check-in, various in-room entertainments via the television or video games, internet connections, in-room mini-bar, etc. Guo (2010) describes how mass customization can support the China railway freight transportation system through product design innovation and service process diversification. Elsewhere (Chen and Pau, 2009), results on mass customization of wireless communications and services are presented. It advocates for a user-centric view of wireless service configuration and pricing as opposed to present-day service catalog options. Cohen (2007) proposes how mass customization can be applied in the training industry. Piller and Kumar (2010) provided a number of case examples from the automotive, sports equipment, and credit card industry to explain how mass customization supports and enhances operational and market effectiveness. Waslander (2007) explains how the Dutch secondary schools which faced

a diversity-efficiency dilemma successfully applied the principles of mass customization to add diversity without adding costs. See Da Silveira et. al, (2001) for additional examples of applications of mass customization in both manufacturing and service operations.

There also exist numerous conceptual ideas regarding the application of mass customization in service operations. Bask et al. (2011) developed a framework for analyzing service offerings in terms of modularity and customization. The framework provides a basis for analyzing different combinations of these two aspects from three perspectives: service offerings, service production process, and the service production network. Liu and Xu (2009) suggested that the modularization, delay strategy, and e-commerce platform are the basis for the realization of mass customization in non-physical product service industries. Li (2004) proposed a mass customization based service product innovation (MCSPi), which integrates the personalized service feature from the service industry and the efficiency of mass production in the manufacturing industry. It includes four features: marketing, organizations, engineering design and operations management. Wind and Rangaswamy (2001) presented a concept called customerization, a buyer-centric company strategy that combines mass customization with customized marketing. In addition to its potential benefits and possible challenges, the authors described how such a strategy is different from mass customization, personalization, and one-to-one marketing. Dellaert and Dabholkar (2009) investigated the antecedents of consumer intentions to use mass customization on the Internet. It found that both increasing the range of mass customization options and providing complementary on-line services enhance the perceptions of product outcome, control and enjoyment in using an on-line mass customization process. Migas et. al (2008) proposed an idea based on the principles of mass customization to create brochures for the tourism industry using the digital printing technology, which may be

distributed via the internet to potential users. Using the channel theory framework and based on the mass customization concept, Kamali and Loker (2006) investigated the on-line involvement of consumers in product design. It was a web-based simulation experiment that showed that the Internet provides an effective interactive platform and distribution channel for selling mass-customized clothing and should be considered by e-tailers.

Peters and Saidin (2000) investigated the MC implementation issues and concluded that companies wishing to adopt an MC strategy must be able to understand various market factors and customer demand factors. Specifically, they concluded that information technology related factors and process capabilities are most difficult to implement. On the other hand, modularization for service operations is relatively easy to achieve. Furthermore, knowledge based services provide better customization opportunities than physical goods due to the higher level of customer contacts. Elsewhere (ter Harmsel 2012) presented a revised framework for mass customization that can be used as a means to achieve a competitive advantage for service organizations by efficiently meeting the diversity of customer requests. With examples from the banking and software services, it was argued that services should be viewed as a process of customer co-creation that creates substantial customer value instead of focusing solely on cost reduction through the economies of scale.

5. Conclusion:

Mass Customization is a business strategy that, if implemented appropriately, could result in significant benefits for a company. The development of a continuous elicitation process with the customers, a flexible manufacturing and operational system, and a dependable logistics system are the basic principles for the design of the production process. Without doubt, the mass customization principles can be applied in both manufacturing and service operations. This

paper provides a literature review of the application of mass customization in businesses that create and deliver both tangible goods and intangible services in order to satisfy their customers' need and expectation.

It could be stated that there exist plenty of possible applications of mass customization that have not yet been explored. Technology has played an important role in the application of mass customization in many business environments and will continue to do so in the future. Advances in technology as well as the ever changing customer needs and market competition will compel manufacturers to find innovative ways of adding value to their products and services. Mass customization will remain one of the options that many firms will need to pursue.

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