

ONE SIZE DOES NOT FIT ALL

Piotr Betlej

University of Information Technology and Management
ul. Sucharskiego 2, 35-225 Rzeszów, Poland
pbetlej@wenus.wsiz.rzeszow.pl

ABSTRACT

Mass customized products, or products that are, literally, made to order are subtly, yet profoundly different than their Henry Ford-like “one size fits all” counterparts. To find clothes in a retail store is a problem for quite a lot of individual, especially for those with extensive body disfigurements. Today, information technology brings the industry the aids to produce and offer mass customized garments to a greater variety of customers.

Made to measure clothing, which offers the customer a free choice that is guaranteed to be a perfect fit, while retaining individual look, points the way towards the future development of the textile and apparel industry.

KEYWORDS

Individualization, mass customization, textile industry.

1. INTRODUCTION

The idea of mass customization is that garments can be made to individual customer requirements, with regards to fit, color, and small styling details and can be sold at a price only slightly higher than an off-the-peg equivalent. Imagine choosing an existing garment style from the stores range and having it made to your measurements with small styling alterations, and therefore creating a garment unique to you.

There are very few people who can always walk into a shop and fit into the garments they choose. You’ve seen a great pair of trousers, you try on your size but they are a bit tight around the hips and slightly too short but you buy them anyway because you like them so much, but then you never end up wearing them. It’s a common scenario and has probably happened to most of us. Now, take the same pair of trousers, you try them on and show the assistant the problem. You can then be measured and place an order for those trousers. It is at this point that you could also change other details such as fabric color, button design, and pockets.

On the other hand you may find that some garment features are difficult for you. With minor changes a garment might be much more functional while keeping all of the good styling points. The manufacturer can use your measurements to determine to the most suitable size pattern, this is then altered slightly to create a garment just for you.

2. MASS PRODUCTION VS. MASS CUSTOMIZATION

Mass production is a supply driven business model while mass customization is a demand driven business model.

The difference between mass production and mass customization lies in who makes the decisions on how to configure the product - the producer or the consumer. The slogan for mass production - one size fits all - loses relevance in today's Information Age. Mass production is about producing more of the same thing and mass customization is about producing more of what the customer wants.

The world of mass production allows companies to turn out identical products cheaply but involves high fixed costs and low marginal costs. Producers make money by cranking out as many units as possible, driving down the average production cost by spreading the huge fixed cost over more and more units. As a result, consumers sacrifice the luxury of personal attention for affordability.

The world of mass customization spreads the fixed costs over a more diverse product line lowering the average cost per product permitting low prices along with the bonus of producing exactly what the consumer wants. Information Age technology allows the producer to know each consumer's preference and deliver what the customer wants at a reasonable price. Producers change designs quickly and inexpensively, winning customers by targeting individual tastes and preferences.

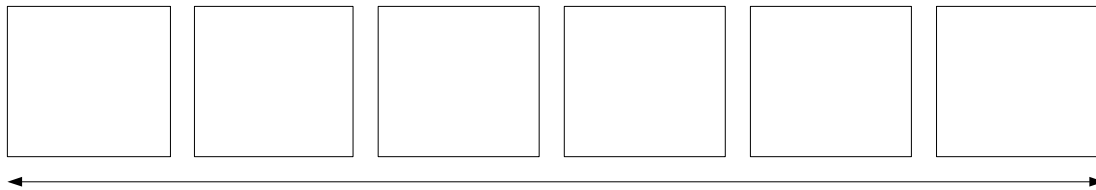
Techniques of mass customization enable an increase in apparel production variety, without compromising a company's competitive cost structure. Modern technologies slash fixed costs in three areas: information, production and distribution. The Information Age makes it cheaper to personalize during production through smart automation and this removes the last barrier to providing goods and services for individual customers. Computer-aided design CAD is replacing costly prototypes. Computer-aided machinery CAM allows production to shift from one style to another. Improvements in distribution made possible by such technologies as lasers and computers, reduce the fixed costs of getting products to consumers.

The economics of retail gravitate to Mass Customization as a major solution for the retail business model. The customer gets exactly what they want boosting customer satisfaction and the merchant retails with little or no inventory. The Mass Customization business model will demand fast production cycles, skilled labor, and local shipping which will result in the re-industrialization of the United States economy.

Traditional retailing is a supply driven economic business model. Create supply and then sell that supply to the customer. The greatest risk of a supply driven economic business model is the unsold supply (inventory). Traditionally the risk of inventory is reduced by sharing that risk between the manufacturer and the retailer.

Mass Customization is a demand driven economic business model. Create demand and then create the supply to meet that demand. There is no risk of inventory and therefore there is no need to separate manufacturing and retailing. The greatest challenge for a demand driven economic business model is creating the demand and matching it with production capabilities. The natural merging of the retailer and the manufacturer, vertical integration, allows Mass Customization to stay competitive as profit margins are merged. The added benefits of Mass Customization due to vertical integration is a tighter control over brand and quicker response times in the market place. ¹

From Mass Production to Mass Customization



Source: Lenda Jo Anderson, Evelyn Brannon, *Discovering the Process of Mass Customization: A Paradigm Shift for Competitive Manufacturing*, National Textile Center Annual Report: August 1995

3. SIGNALS FOR CHANGE

There are some key indicators that it is past time for change. The first is that service expectations are higher than they have ever been. Consumers used to tolerate substandard service, but today, they do not have time for it. People are no longer willing to stand in lines and be ignored by bank tellers, hotel receptionists or other service providers. They want immediate and personalized service.

Second, consumers want more variety. It is really easy to investigate some of the consumer products and the options that are available today. Everyone wants to wear unique clothes. The fact is that we do not like to wear the same “outfit” like other people unless we are wearing apparel that represents a team.

The third reason it is past time for change is that consumers no longer want to order goods and services and have to wait for their delivery. Ten years ago if a catalog order was placed, the expected delivery was four to six weeks. Today, after two or three days, consumers begin to wonder where and why their merchandise is being delayed.

The textile and apparel industries are not the only industries impacted by these signals. Other industries are also experiencing the kinds of changes that are causing a breakdown in mass production concepts. It is happening for example in telecommunications, automotive, banking and insurance industry. Everywhere one looks, there is a shift towards more personalized products and services.²

¹ Interactive Custom Clothes Company, *Mass Customization*, <http://www.ic3d.com/>

² Michael T. Fralix, 2002, *From Mass Production to Mass Customization*, Journal of Textile and Apparel Technology and Management, Volume 2, Issue 2, Spring 2002

Mass Design
 Mass Production
 Mass „fit”
 Mass Locations
 Existing Fabric

Design Options
 Mass Production
 Mass „fit”
 Mass Locations
 Existing Fabric

4. BENEFITS OF MASS CUSTOMIZATION

Nowadays companies are being faced with competition in the marketplace and are looking for different business strategies to redefine themselves in this changing business environment. Secondly, linking and enabling technologies like faxes, modems, and kiosks now allow manufacturers to communicate better, faster, and more effectively with the consumer and within the organization. Manufacturers can now establish direct contact with consumers to learn what they desire in products. Enabling technologies like CAD/CAM, laser cutting, and body scanning allow manufacturers to cost effectively deliver lot sizes of one to meet consumer demand.

The far-reaching effect of mass customization is higher customer satisfaction. Higher satisfaction rates benefits both the consumer and the manufacturer. The time-starved consumer gets exactly what they want by configuring their perfect product that embodies their personal taste and style. The consumer saves time because they no longer have to shop at many different places and take the time to try on many different items.

In mass customization production does not begin until the manufacturer knows exactly what the customer wants, there is no unsold inventory to mark down, no production to finance because typically the producer receives revenue from the customer before vendors are paid. Manufacturers benefit from mass customization by operating with higher margins with little or no inventory and by delivering products with low return rates.

Inventory control is one benefit clothing manufacturers could gain from mass customization. These manufacturers tend to have high inventories of finished products and must forecast demand many months in advance. But those forecasts are likely to be wrong, resulting in surpluses of some products. The apparel industry must have fire sales every season to get rid of goods that no one bought. But if they could make goods on demand, they would save money because they would not have the cost of carrying inventory, taking returns or having fire sales. So mass customization can yield a lower overall cost, and it may have additional value because often you can charge a premium for it. It's just a matter of time before mass customization is embraced by major clothing manufacturers for at least some of their products.³

5. RESOURCES NEEDED

What's needed to transfer the concept of mass customization to the commercial clothing industry is for manufacturers to abandon their mass-production techniques and create flexible product-manufacturing teams that would be able to add to clothing special features.

³ Pine, B. J., 1993, *Mass customization: The new frontier in business competition*, Boston: Harvard Business School Press

If mass customization - tailoring products to individual customers - really is the future of manufacturing, a key to that future is information technology. Creating customer interface software for capturing the needs of individual consumers and database software for maintaining extensive customer preference information will be important to the adoption of mass customization. Integrating new systems with existing systems and data is very difficult. This is particularly important for companies with an installed base consisting mainly of custom software. Most of the companies do not have a unified strategy relating IT investments to organizational changes. Many companies have no IT strategy.

There is a small number of IT providers that offer integrated solutions customized for the textiles and clothing manufacturing environment and needs, especially at the low end of the chain. As an example, the major European IT provider of ERP systems, SAP, have just recently customized their R/3 systems for the Apparel and Footwear industries.

Manufacturers will need electronic order-acquisition systems that capture people's measurements over the Web or in retail stores; order-processing software to coordinate the acquisition of raw materials and the shipment of finished goods; databases to make sure custom clothing is designed to the right specifications; and computer-aided design systems that can convert custom designs into cut pieces of cloth that can be sewn together.

The components of each product should be standardized enough in order to take advantage of economies of scale - through decreasing average costs. On the other hand, it remains imperative to provide all the different consumer groups with products that seem to be unique for each of them.

The complexity and peculiarities of the textiles and clothing industries related to the need for quick response to market demands, long and complicated production cycles, and above all the large product variety (need for a 4 dimensional matrix approach comprising product, style, color and size components), which results in large volumes of data to be handled.

Made-to-measure production and distribution will set new standards and requirements that will enable:

- faster, more automatic measurements by the use of 3D full body scanners;
- the introduction of a new shopping experience with the use of VR visualization tools;
- the development of advanced Distributed Order Handling Systems connecting many retail outlets to a number of apparel manufacturing sites, producing made-to-measure garments.

6. BODY SCANNING

For some apparel manufacturers, the term mass customization means manufacturing clothes that have been pre-alerted to fit an individual's body. A potential enabling technology for this method of creating individualized products is body scanning. Through body scanning, a three-dimensional image of person's

body is captured electronically. Critical measurements are then extracted from the digital image and downloaded to a pattern alteration system. The altered patterns are placed in a marker, cut, and assembled.

There has been continued development of body scanning technology over the past few years and the parallel introduction of computer-aided design CAD functionality, which is automating many aspects of product development and pre-production, from design conceptualization through marker making.

3-D body scanning and measurement extraction technologies will be key technologies going forward. Tape measurers simply are not accurate enough, and every manufacturer of custom-made apparel we have talked with agrees.

Instead of trying on clothes in one of the store's changing rooms, the customer gets body scanned in a laser cubicle. The "digital twin" can then be stored and retrieved at any time. This revolutionary approach to developing an individualistic element in the fashion chain came about when Tecmath AG of Germany produced a scanner able to "read" two million measuring points in less than 10 seconds. The customer can choose from 100 different, high quality fabrics, choose the accessories and most of the details. The scanned data and the information about the selected material can then be sent by data transfer to one of four manufacturers in Germany. Four weeks later, the customer can pick up the tailor-made clothing at the store.⁴

Apparel manufacturers and retailers are now starting to realize the benefits of the latest body scanning. However, 3-D body measurement - a media darling over the past year - is only one piece of the mass customization puzzle. The industry also must be able to master short-cycle, flexible manufacturing; virtual try-on capabilities (which will allow consumers to accurately model garments via computer); and digital printing (which will provide manufacturers with a means to print fabric for individual garments).⁵

7. NOT ALL PRODUCTS

While some customizable products seem interesting and useful and others do not, the question is raised of what really can be mass customized? Where will the limits of technology and customer demand stop? No matter how advanced the technology and possibilities go, there will always be some quantity of products that are simply made one way in one size for all interested customers. This is true for several reasons including that people love to shop in stores, always have and always will. Some products (like computers) will have so many different permutations, it will be impossible for a company to offer all of them in a retail setting. Another strike against mass customization is the fact that some people don't want choices. Customizing products will not only put more demand on the consumer to take part of process, it

⁴ Peter Saab, *Mass customization - more than a futuristic dream in Germany*, <http://www.tdctrade.com>

⁵ Lisa C. Rabon, 2000, *Mixing the Elements of Mass Customization*, <http://www.findarticles.com>

may even be off-putting to some. Designers alike will likely take issue with wanting their products to go on the market untouched and unscathed.

8. EXAMPLES

Custom Foot Inc., Florence, Italy

The Custom Foot offers a new concept in fitting customers with shoes. The selection of shoes collected on the shopping floor of Custom Foot is available for selection of style only. After a customer chooses a style, precise measurements of the consumer's feet are taken using a computer scanner in the store, which takes about 30 seconds to register different sizes and widths, distinguishing the right foot from the left. Consumers then choose their shoe style from swatches of different materials. Customers' measurements and choices of style, color, and material compose an order that software translates into Italian and sends to Custom Foot's Florence office by modem. The orders are distributed among six factories in Italy, and one in America. Production and delivery takes about three to four weeks, providing customized footwear for a cost of about \$180 per pair.

Levi Strauss in Mountain City, TN, U.S.A

In 56 original Levi's stores across the United States and Canada, Levi Strauss & Co. is using mass customization with its Personal Pair women's custom fitted jeans program, and will begin providing men's custom jeans in the near future, as well. In the store, a trained sales person takes four initial measurements of the waist, hip, inseam, and rise. These measurements are entered into the computer system, which suggests a prototype-test garment. The consumer tries the prototype on and fit modifications are made in any of four areas of the garment, based on the consumer's preferences (such as a tighter fit, looser fit, shorter, and longer). Two or three prototypes are usually required to find the perfect fit for the customer. Having specified these processes, the order is sent via modem to Levi Strauss in Mountain City, TN. The cost of this process comes out to about \$65 a pair (around \$15 more than buying directly off-the self), with about three weeks needed for production and delivery.

Second Skin Swimwear, Juno Beach, FL, U.S.A.

In the Second Skin Swimwear store, a customer begins every step in buying customized swimwear with trained salesperson. First, by trying on sample suits (20 one-piece suit styles, and a combination of about 20 top and bottom styles), the customer finds the preferred style. After that, a digital camera scans the customer for about two minutes, and then the customer chooses the preferred fabric. This whole "Digifit" process takes about one hour. All information related to this process is recorded by a trained salesperson and entered into the store computer system to eventually be sent by modem to Second Skin's headquarters in Juno Beach, FL. This recorded information is also stored in a disk and downloaded at the

factory. The delivery time required for completed customized swimwear is less than two weeks, at a price of between \$90 and \$200 per suit, depending on the customer's add-on preferences.⁶

BlackFrock.com, UK

This UK site launched in April 2000, is one of the new breed of virtual merchants that believes women should be in total control of the sale. With the little black dress as the star of this site, you can choose the neckline, sleeve and length of your very own dress. It'll be manufactured to your tastes and on your doorstep within 12 days, for between \$85 and \$110. Managing Director Fiona Davies says BlackFrock.com has a distinct advantage over conventional retail: "We concentrate on stuff that really adds value, like material, manufacturing quality and customer design." The customers will even control which products are added in the future. Feedback on the "Make a suggestion" area will influence the product line, which will change significantly every three months, says Davies.

Americanfit.com

Americanfit offers classic bottoms, including shorts, skirts and pants, all cut exclusively for each customer. While they offer only certain styles, the fit is entirely up to you - you enter your measurements, which are then stored in the company's database for future purchases. "By allowing our customers to design the product according to their choices they become emotionally involved in the process; it's their creation," says Jonas Tamir, president of Americanfit.com. Customers who seek out Americanfit.com are mostly women's sizes, petites and hard-to-fit bodies for example, if the weight is not distributed proportionally between the waist line and the widest part of the hips, says Tamir. The styles include stretch cotton pants, walk shorts and skirts that are priced just over \$100. The company will also introduce tops and jackets in the future, says Tamir.

Interactive Custom Clothing Company

The leader in online mass customization is New York-based Interactive Custom Clothing Company, launched in 1996. IC3D Jeans gives you the control over both the design and fit of your custom-made bottoms. Choose from a huge variety of fabrics (stretch denim to faux python to leather) and details (you can even choose the thread color on your jeans).⁷

9. CONCLUSIONS

⁶ Seung-Eun Le, Joseph C. Chen, *Mass-customization Methodology for an Apparel Industry with a Future*, Journal of Industrial Technology, Volume 16, Number 1 - November 1999 to January 2000

⁷ About.com, *Fashion for a market of one - you!*, <http://fashion.about.com>

It won't be long until smart entrepreneurs offer mass customization at lower prices than mass produced clothes. Industry analysts says that as much as \$15-20 billion in apparel must be sold at deep discounts or simply given away annually due lousy predictions on consumer demand. What if you no longer had to guess production runs, because you'd use the latest technology to make only what had already been bought. Not only would this allow you to cut your production costs, but you could pass those along in lower prices, and, from an environmental perspective, eliminate not only all of the material waste in overproduction, but also all the packaging, transportation and warehousing impacts - a sizable reduction in overall environmental impact.

Despite the obstacles, it is clear that Mass Customization and the products that can be customized will grow. What does that mean for consumers? More choices, more 'interactive shopping' and more personalized clothes. Gone will be Henry Ford's famous quote, "any color you want as long as its black". More like any design and color you want, you get!

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